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MENTAL HYGIENE IN THE STATE HEALTH DEPARTMENT

By VICTOR H. VOGEL, *Passed Assistant Surgeon, United States Public Health Service*

It is not necessary to agree with psychoanalytical methods of treatment to quote with approval a statement made by Freud 22 years ago:

> But one day the conscience of society will awaken, and we shall realize that * * * man has the same claim to mental treatment that he now has to surgical aid. And we shall also come to see that the neuroses menace the health of the people no less than does tuberculosis, and that, like tuberculosis, the neuroses cannot be left to the ineffectual care of the individual himself. When that time comes, institutes and consultation centers will be established and staffed with * * * trained physicians, so that men who would otherwise give way to drink, women who might break down as a result of overwhelming deprivations, and children whose c' oice would be limited to delinquency or neurosis, may be strengthened * * * to resist such unhealthy tendencies and * * * become capable of social achievements * * *.[1]

Health officers have been concerned with the conservation and prolongation of life. Remarkable results have been obtained; the average expectation of life at birth has risen from 38 years to 61 years since 1787. But should not health officers be concerned with the quality of life as well as the quantity of life? We deal not with pigs or chickens, but with human beings, individuals who have emotions, who have likes and dislikes, who experience happiness or sorrow and elation or depression. Not only do we experience these feelings, but they affect directly our capacity to take our place in the community as contented, healthy, law-abiding, self-respecting, self-supporting citizens. Mental hygiene is concerned with the abilities of people a adapt themselves to life; to live happier, more productive lives. matter of fact, from the standpoint of longevity alone, men isease is a matter of public health concern because "* * * ie mortality rates of the mentally diseased are at least five ti as high as the rate for the general population * * *."[2]

Should deaths by suicide concern the healt ficer less than deaths from typhoid or diphtheria? Is an emotio y dead person maintained for forty years in a mental institutio ess of a community problem

[1] Freud: Address given in 1918 at the Internatio sychoanalytic Congress in Budapest. The Psychoanalytic Quarterly, 9: 164 (1940).

[2] Falk, I. S., and Hirsch, N. D. M.: S security measures as factors in mental health programs. Publication No. 9 of The American A ation for the Advancement of Science, p. 194.

than a person dead of smallpox? The productive labor of both is permanently lost to the community but the psychotic individual is a ward of the State at perhaps $350 a year until he dies, when it still costs just as much to bury him as it did the smallpox victim. The mentally ill person maintained by his family outside the institution is not necessarily any less of a problem. Many the family whose normal relationships with happy emotional life for the children and happy marital accord for the parents are disrupted by the presence of a mentally ill person. Can we doubt that increased juvenile delinquency and rising divorce rates result? Is not a divorce as serious to the total well-being of a community as a case of diphtheria?

Chronic invalidism in neurotic individuals undoubtedly is a greater drain on the resources of a community than all its cases of typhoid fever. It is probable that the total incapacity from all types of mental disorder in a community is greater than the disability from all physical conditions combined. In the United States, "the number of totally and permanently disabled mental deviants (exclusive of the temporarily or partially disabled) is probably about 2 millions, and they, taken together with the immediate members of their families, probably equal nearly 7 million persons." [3] Are not such problems as tantrums, extreme shyness, troublesome aggressiveness, and pathologic lying or stealing in children matters that concern human welfare, and are they not evidence of levels of health? They are forerunners of far more serious threats to total health than arise from dental caries, flat feet, or poor posture, which give concern to public health officials.

Dr. Ira S. Wile states:

> It must be obvious that public health should concern itself with life—and all of it. This involves promoting the prevention of all things that tend to diminish the fullness of life, its intensity, its extent, or its duration. Every community harbors many individuals who are not defective nor psychotic, but who are unstable, inefficient, inadequate, antisocial, and they are all communal hazards. Many of them are merely victims of societal indifference or neglect. Some of them in sheer ignorance would in turn make society their victim. Mental hygiene would seek to restore such persons to normality, but further, would attempt to lessen the likelihood that such unhealthful groups will develop. Hence, mental hygiene has value in pointing out some of the factors and consequences of the struggle for well-being. It can indicate the way of avoidance, the presence of and the mode of release from fears and anxieties. It would have men fit to live * * *. It would have men fit to work * * *. It would have men fit to learn * * *. It would have him fit to love. * * *.[4]

The capacity to live productively and happily is surely a concern of the same humanitarian organization which has been so long engaged in promoting public health in its usual conception. This quality of

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[3] Falk, I. S., and Hirsch, N. D. M.: Social security measures as factors in mental health programs. Publication No. 9 of The American Association for the Advancement of Science, p. 193.

[4] Wile, Ira S.: The mental hygiene approach to public health. Mental Hygiene, 17: 380-395 (1933).

living is, I believe, the biggest problem yet remaining in the public health field. And the public health profession is responding. It is accepting the responsibility for obtaining better housing and better conditions of nutrition, which are concerned more with a better way of living than a better length of living. The Chairman of the Division of Medical Sciences of the American Medical Association in his recent address to that body, says:

> The health officer is responsible also for the development of health programs in special fields such as cancer control, mental illnesses, industrial hygiene, and the identification and treatment of crippled children.[5]

There are a number of reasons apparent why a concerted public health attack on mental health problems has so long been deferred. Techniques for accomplishment in this field have been obscure, but they are becoming clearer. More specialists, i. e., psychiatrists, psychologists, and social workers, are needed, but they will not appear in numbers until a demand for them is created. The very magnitude of this problem of assisting individuals to better social and community adjustment and the difficulty of deciding the most vulnerable points for a primary attack have deferred an organized concerted effort to reduce mental illness. Many of the factors which have delayed until recently an effective attack on syphilis apply to the field of mental disorders. I mention the stigma which society has attached to both of these types of illness with a consequent reluctance to admit the presence of disease in self or family, and with consequent disinclination to seek medical help, which in both cases has been prolonged and expensive. There is ample evidence, however, of a changing public opinion and, as in the case of syphilis, it is believed that an improving attitude of the public will not only permit but demand an effective program.

The President of the American Psychopathological Association[6] recently urged that the United States Government conduct a campaign for mental health similar to the campaign against syphilis. This
opinion is one of an increasing number which recognize the necessi.
for a public health type of approach to the mental disorder pygiene
Dunham recently wrote that a primary condition for a ment program.
program is that "* * * it should be a public h ission of this
* * * There is no need to enter into an extended mental disease is
point for it is well recognized that the prevalence could make much
of such magnitude that no private enter ne problem traditionally
headway in dealing with it, and, beside nce with the present Federal
belongs to the State * * *. Exp hilis may prove valuable along
program for the eradication of s

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[5] Diehl, Harold S.: Medical careers in pu health. Chairman's address. J. Am. Med. Assoc., 115: 343–345 (August 3, 1940).

[6] Tomm, Douglas A.: Presidential address at Cincinnati, 1940.

certain lines in developing an attack against functional mental disorders." [7] Strecker recently stated:

> * * * physical hygiene or public health and mental hygiene are i· ·parable. The boundary line between them is hypothetical and he who cannot see ... they merge into each other and belong to each other is not sound in his reasoning. . ne ultimate objective of the doctrine of a sound body is the production of a better and more fruitful mind.[8]

The appalling number of mental cases in institutions is well known. More than 600,000 persons in the United States are confined at present at a maintenance cost of over $200,000,000 a year. New cases are being admitted at the rate of about 120,000 a year. States are struggling in an effort to provide beds for this tide of admissions. It has been said that, "We have been so busy trying to bail out the boat that we haven't had time to caulk the seams." [9] There have been sincere efforts of various individuals and organizations to "caulk the seams." The activities of the National Committee for Mental Hygiene, organized in 1909, are notable. A number of mental hygiene clinics have been established with its assistance and a number independently, but no organization big enough and with sufficient resources has taken the responsibility for rendering an adequate service. Psychiatric clinics can rescue some from this stream of committed persons. If every admission to a State hospital costs the community $7,000, as has been estimated,[10] only three cases prevented or treated successfully short of institutionalization would be necessary to save the annual budget of a mental hygiene clinic. Furthermore, it has been estimated that 20 percent [11] of cases now in State mental institutions could be paroled if there were clinic facilities in the communities for supervision after release.

Is it good business to continue paying $200,000,000 a year for custodial care of psychotic persons without a determined effort to reduce the hospital bill both by research and clinics for the application of such preventive and early treatment procedures as are already
E. ? There is a great need for further research, but, as Dr. C.-
and wa inslow says, "Nor is it feasible to forget the whole situation
The men a the progress of 50 years has automatically clarified it.
battles. They women who are living today are fighting their daily
d, they demand, they deserve the best aid which

[7] Dunham, H. Warren. Ecolo
Mental Hygiene, 24: 244–245 (April studies of mental disorders: Their significance for mental hygiene.
[8] Strecker, Edward A.: Mental hygie
[9] Roosevelt, Franklin D.: In presenting th Nelson Loose-Leaf Living Medicine, vol. 7, chapter 12, p 402.
Governor of New York. 932 report of the New York State Health Commission, while
[10] Hincks, C. M.: Public education and mental hygiene. In Proceedings of the First International Congress on Mental Hygiene held at Washington, D. C., May 5–10, 1930, vol. 2, p. 564 (1932).
[11] Rosanoff, Aaron J.: Extramural care in California. A. J. Psychiat., 97: 235 (July 1940).

our present knowledge of the danger and our present weapons of defense permit." [12]

Mention must be made of the still larger group of persons who stand but little danger of becoming psychotic or committed. I refer to many of the behavior problems in children, the neuroses with their prolonged disabilities, and especially to the problems in psychosomatic medicine. It has been estimated that 35 to 40 percent of all persons carrying complaints of organ dysfunctions to physicians are suffering primarily from an unrecognized emotional or personality disturbance. One author puts the figure as high as 85 percent.[13] Many of these patients, who might be restored as productive members of society, in the absence of adequate appreciation of their problems become the subjects of medical mismanagement, which frequently results only in a more firm conviction regarding the organic source of their disability. It is disturbing to consider the number of thyroids needlessly removed from patients suffering with anxiety syndromes, and the pelvic operations performed because of sexual maladjustments expressed as disturbances in genitourinary physiology. Billings [14] has shown not only that a great many of these cases can be successfully treated, but that it is financially advantageous to the general hospital to do so. Of still greater significance is his observation [15] that almost half of such problems can be successfully treated by the nonpsychiatric practitioner after observing the work of a psychiatric consultative unit and becoming sensitized to the presence of psychosomatic factors. Treatment at this level is real preventive endeavor, since it is when such cases first consult the general physician with organ complaints that the type of understanding and medical attention they receive may determine their prompt restoration to health, or progress along the path of chronic invalidism with a resultant incalculable economic loss to the community.

Referring to results to be expected from the child guidance activities of mental hygiene clinics, it has been estimated that in 25 percent of such cases the presenting problem is completely eliminated, and in an additional 50 percent there is great improvement. In one State in 1938, it is estimated that one child guidance clinic, under the State health department, with a generous budget of $30,000, saved the State $140,000 through children saved from correctional institutions. Another State [16] which has established limited community

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[12] Winslow, C. E. A.: A community mental hygiene program—the next great opportunity. Milbank Memorial Quarterly, July 1935.

[13] Mikkelson, Harold W.. The general practitioner and psychiatry Delaware State Med. J., 12: 91-93 (May 1940).

[14] Billings, Edward G., McNary, W. S., and Rees, M. H: Financial importance of general hospital psychiatry to hospital administrator. Hospitals, 11: 40-44 (March 1937).

[15] Billings, Edward G.: Liaison psychiatry and intern instruction. J. Assoc Am. Med. Colleges, 14: 375-385 (November 1939).

[16] Bahr, Max A.: A Diagnostic Clinic and Community Service as a State Hospital Function. (Indiana.)

service estimates that from 15 percent to 20 percent of patients treated and who would under ordinary circumstances be committed would not become institutional cases, saving the institutions approximately $583,440, if the community clinic plan existed on a State-wide basis. It is estimated that in this same State $284,452 could be saved by the discharge of approximately 15 percent of the institutional cases if adequate clinical facilities were available for parole supervision. This does not include such intangible, but more important, results in the way of improved family relationships and increased happiness.

Osler once said, "There are people in life and there are many of them whom you will have to help as long as they live. They will never be able to stand alone." [17] It is this type of person who may be kept on the job, self-supporting, and relatively happy by mental hygiene guidance. Is it not more important to assist in a lifelong productive adjustment of an individual than merely to prolong his life without regard to the type of living experienced? "For each individual who is actually deranged mentally there are at least 10 who are blindly groping in that dread 'no man's land' between reality and unreality, or sanity and insanity." [18]

Scientific papers are appearing in increasing numbers establishing the epidemiology of mental disorder.[19] Recent work by Faris, Dunham, and Fairbank has established the definite association of various types of mental disorder with social and economic factors of the

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[17] Osler, William, and Langdon-Brown, Walter Thus We Are Men Longmans, Green & Co, New York, 1939.

[18] Strecker, Edward A : Mental hygiene Nelson Loose-Leaf Living Medicine, vol 7, chapter 12, p 400

[19] Elkind, Henry B.· Is there an epidemiology of mental disease? Am J. Pub Health, 28, 215 (March 1938).

Hincks, C. M.. Achievements in mental hygiene and promising leads for further endeavor. Am. J. Pub. Health, 28: 251 (March 1938).

Dunham, H Warren Ecological studies of mental disorders· Their significance for mental hygiene Mental Hygiene, 24: 244-245 (April 1940).

Faris and Dunham. Mental Disorders in Urban Areas University of Chicago Press, Chicago, 1939.

Cohen, Bernard M , and Fairbank, Ruth E.. Statistical contributions from the mental hygiene study of the Eastern Health District of Baltimore. I. General account of the 1933 Mental Hygiene Survey of the Eastern Health District Am J. Psychiat., 94: 1153-1161 (March 1938).

Cohen, Bernard M , and Fairbank, Ruth E.. Statistical contributions from the mental hygiene study of the Eastern Health District of Baltimore. II. Psychosis in the Eastern Health District. 1. The incidence and prevalence of psychosis in the Eastern Health District in 1933. Am. J. Psychiat., 94: 1377-1395 (May 1938)

Limburg, Charles C.: Community differences and mental health Publication No. 9 of The American Association for The Advancement of Science, pages 250 255.

Fairbank, Ruth E.· Mental hygiene from the epidemiological viewpoint. Reprinted from Contributions dedicated to Dr. Adolf Meyer, 1937, pp. 89-94.

Caldwell, Morris Gilmore· The sociological tract The spatial distribution of social data. Psychiatry, 1: 379 385 (August 1938).

Rogers, L M.: An epidemiological approach to the prevention of chronic physical, mental, and social illness Psychiatry, 2: 483-491 (November 1939).

Fairbank, Ruth E.: An approach to prevention in mental hygiene. School of Hygiene and Public Health, Baltimore, Md. Extrais des Comptes Rendus du 11• Congrés Internationale d' Hygiene Mentale, Paris, July 19-23, 1937.

Fairbank, Ruth E . "Epidemiology" in mental hygiene. School of Hygiene and Public Health, Baltimore, Md. Ibid.

community. Rogers and Limburg will soon publish correlations of 75 such factors with mental disorder in Kentucky. These authors are also attempting to arrive at a determination of the total burden of mental disorder in the surveyed area. The incidence of mental hospital admissions is well known for many areas, but the complete number of lesser disorders in a community has never been determined. As mental disorder is recognized more and more to be susceptible to statistical consideration and its occurrence in proportion to certain environmental conditions and even a certain degree of "infectiousness," it seems more and more suitable for attack by procedures now in use by health departments. The growing interest of practical public health trained physicians will undoubtedly result in more and more data concerning the epidemiological nature of mental disorder and in the development of better techniques for prevention and early treatment. There appears to be no doubt but that at least some mental disorder has its roots in community social and economic conditions. Faris and Dunham, for example, have shown an increased incidence of schizophrenia in deteriorated slum types of urban areas and have even shown that certain types of schizophrenia are more apt to occur under certain conditions. There are increased efforts to treat the occurrence of mental disorder in a better statistical manner. "New Facts on Mental Disorder," a recent book by Neil Dayton, and the various papers by Pollock and Malzburg of New York, are notable.

A prominent psychiatrist and a professor of public health administration in one of our leading colleges have independently estimated that one-half of all mental disease is preventable by the application of present knowledge of mental hygiene.[20]

Tentative standards exist both as to extent and personnel of mental hygiene or psychiatric clinical facilities.[21] A city of 100,000 population should have a full-time mental clinic unit, consisting of 1 psychiatrist, 1 psychologist, 2 psychiatric social workers, and 1 clerk, with an annual budget of $15,000 to $25,000. Such a clinic should serve on a full-time basis, devoting perhaps 2 days a week to adults, 2 days to children, and the rest of the week to special activities, including educational work and special cooperative projects with various social

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[20] Strecker, Edward A.: Mental hygiene. Nelson Loose-Leaf Living Medicine, vol. 7, chapter 12, p. 404.

Emerson, Haven: The magnitude of nervous and mental diseases as a public health problem. Proceedings of the First International Congress on Mental Hygiene, vol 1, p. 209 The International Committee for Mental Hygiene, Inc , New York, N. Y., 1932

[21] Standards of Training of Professional Personnel in Psychiatric Clinics. Publication of New York State Committee on Mental Hygiene of State Charities Aid Association and Mental Hygiene Section of Welfare Council, September 1935

Suggested survey schedule with tentative standards for the study of mental and functional nervous diseases. Committee on Administrative Practice, American Public Health Association, New York, N. Y., 1929.

Stevenson, George S.: A suggested community mental hygiene program. The National Committee for Mental Hygiene, New York, N. Y. Am. J Pub. Health, 21: 1301 (1931)

Practical State program for care of the mentally deficient The American Association on Mental Deficiency, 1940.

agencies. Smaller communities should receive part-time services on the basis of their population. These standards are minimal, but in 1934 about one-fourth of the cities over 100,000 population, and almost two-thirds of the cities between 50,000 and 100,000 population, had no psychiatric clinic facilities for children or adults.[22] One predominantly rural State which the author recently visited has no mental hygiene or psychiatric clinic facilities either under or independent of its 2 mental institutions and has only 2 private psychiatrists in practice in the entire State. Fifteen States are entirely without mental hygiene or psychiatric clinics, and there are large areas in other States in which no such facilities are available, not even private practitioners or pay clinics; no one to whom a patient facing mental break-down or emotional crisis can go for aid; no one to treat early cases of neuroses before they become fixed in the rut of chronic invalidism; no one to recognize early psychoses when treatment is most apt to restore them to society, and no one to whom the general practitioner can refer a case for psychiatric consultation. In the absence of these facilities, whose responsibility is it to organize them? It should be the duty of health officers to work for the establishment of clinics in the communities under their jurisdiction.

In the past, psychiatrists have at times seemed vague in their proposed mental hygiene plans and it has been difficult for sympathetic public health officials to decide what specific steps should be taken to organize community mental hygiene service. In general, mental hygiene endeavors have two aims. One comprises more strictly preventive work or "positive" aspects of mental hygiene, dealing with long range general efforts to better environment, heredity, training, and educative processes. The second aim is the establishment of psychiatric clinical services in child guidance problems, for "the child of today is the inmate of tomorrow," and for neurotic or prepsychotic adults, together with consultative service for practitioners in psychosomatic medical problems. The public health profession has recognized that treatment at one level is prevention at a higher level. The early treatment of syphilis prevents paresis and tabes; the early treatment of acute infectious diseases prevents complications, and the early treatment of tuberculosis prevents its spread. I agree with Dr. Stevenson, Medical Director of the National Committee for Mental Hygiene, that the development of clinical work is the first objective of the mental hygiene unit and that other functions, such as administration, education, community organization, and research, will follow. A community is more receptive to mental hygiene educational work if there is in its midst a clinical unit visibly demonstrating the practical application of community psychiatry.

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[22] The need for a national health program. Report of the Technical Committee on Medical Care of the Interdepartmental Committee to Coordinate Health and Welfare Activities, Washington, D. C., 1938, p. 20.

Communities tire of being *told* what mental hygiene can do without being *shown* what it can accomplish. The clinical unit demonstrating its worth in a community by successfully treating behavior problems, saving children from reform schools, relieving psychoneurotics, and successfully supervising persons paroled from mental institutions can expand almost endlessly with community approval and financial support into other more truly preventive fields. These include parent education, selection of teachers on mental hygiene principles, special classes in the schools, sex education and marital advice, organization of lay groups into mental hygiene societies, fuller cooperation with relief organizations, development of playground and recreational projects, cooperative work with courts and churches, and legal reforms concerning commitment procedures and responsibility for precommitment care of the mentally ill, to mention only a few.

Two specific primary steps are proposed in organizing a mental hygiene program:

1. The establishment of a division or department of mental hygiene or mental health, headed by a full-time psychiatrist of special qualifications, in each State. This department should be either part of or in close cooperation with the State health department, except in States where a well-established mental hygiene program already exists independently or in some other department of the State government.

2. Organization of a mental hygiene or psychiatric clinic in every community, county, or city which now has a health department. This will necessarily follow organization of the State office just mentioned.

Cities of 100,000 or more population must be encouraged and aided in the formation of full-time mental hygiene units. Most of the communities to be served, however, are smaller than this and the States should accept the responsibility for furnishing them with centralized service in the form of traveling or part-time clinical units. Training programs for public health officers and nurses in the field as well as representatives of social agencies, must be inaugurated as a basis for satisfactory community service. Detailed recommendations concerning the formation and administration of State programs are not a part of this paper. The National Committee for Mental Hygiene and the Mental Hygiene Division of the United States Public Health Service can furnish technical help of this nature. State programs must be individualized, taking into account such factors as population distribution and the utilization and organization of such private or other State psychiatric facilities as already exist. One very important point in the organization of psychiatric clinic service should, however, be mentioned. Reference is made to the necessity of preventing overloaded clinics by keeping registrations down to the point where therapeutic accomplishments may be ob-

tained. For the same reason, part-time or traveling clinics should be organized so that the communities concerned are covered at least once a week. In order to do this, it will undoubtedly be necessary in most instances in the beginning to neglect some parts of the State so that others may receive useful service. A clinic which allows its services to be spread so thinly that productive psychotherapy is not possible will not justify its existence to a community which expects results in terms of individuals assisted to better adjustments.

In starting a mental hygiene program, a State may find it advisable to give some additional training in certain phases of mental hygiene to the best qualified man available, inasmuch as psychiatrists with full-rounded training in all phases of mental hygiene work are few. Since details of a State program should depend a great deal on local conditions as found by the psychiatrist heading the mental hygiene department and because of the probable budgetary limitations until the program proves its financial economy to the State, he should probably personally head the first psychiatric unit established. Later, as the program develops, with the establishment of more units to cover additional areas of the State, he should retire more to the position of central administrator and devote his time to general educational and promotional work.

No mental hygiene program will ever be adequate because the world will continue to furnish difficulties to complete individual adjustment; but in direct proportion to the various activities proposed under the general term "mental hygiene," there will be a reduction of hospital commitments, chronic invalidism due to neuroses, divorces, suicides, crime, and delinquency. Of particular interest in these days is the thought that social unrest gives rise to dissatisfaction with existing forms of government and may be responsible for revolutionary movements. In addition to these long-term results, experience in several States demonstrates that immediate financial economy of mental hygiene clinic programs can be expected to repay the budgets of such efforts several times over. The question is not, "Can we afford mental hygiene?", but, "Can we afford to be without mental hygiene?"

DIRECTORY OF STATE AND INSULAR HEALTH AUTHORITIES, 1940

The present directory lists only the personnel holding major administrative posts, i. e., chiefs of departments, divisions, bureaus, and special activities. Members of the board of health, other than the health officer, are not included.

The information has been collected from the State and insular health officers as of July 1, 1940. Corrections have been made,

however, to bring the data up to date as of November 1, 1940, insofar as information on changes could be obtained. An asterisk (*) is used to indicate the fact that an officer has been reported to be a part-time employee. All periodicals and regular publications that were reported are listed.

ALABAMA STATE BOARD OF HEALTH

Montgomery

Administration.
  J. N. Baker, M. D., State health officer
  Douglas L Cannon, M P H , M. D., assistant in administration.
Hygiene and Nursing, Bureau of
  B F Austin, M. D., director
Laboratories, Bureau of:
  S R Damon, Ph D , director
Preventable Diseases, Bureau of.
  D. G Gill, D P. H , M D., director
Sanitation, Bureau of.
  G H. Hazlehurst, C. E., . . E , director.
Vital Statistics, Bureau of:
  L. V Phelps, S. B. in P. H., director
Publications
  Vital Statistics Bulletin—monthly
  Report of State Board of Health- yearly.
  Report of Bureau of Vital Statistics—yearly

ALASKA TERRITORIAL DEPARTMENT OF HEALTH

Juneau

Commissioner of Health
  ***W. W. Council, B. S., M. D.**
  Courtney Smith, A. B , M D , Dr. P. H , assistant commissioner of health
Communicable Disease Control, Division of
  Courtney Smith, A B , M D , Dr P. H., acting director
Maternal and Child Health and Crippled Children, Division of·
  Wayne S Ramsey, A. B., M D., director
Public Health Engineering, Division of
  Kaarlo W. Nasi, B. S E., director
Public Health Laboratories, Division of.
  Warren C. Eveland, A B., M S P H., director
Public Health Nursing, Division of
  Mary K Cauthorne, R. N , director
Tuberculosis Control
  Palmer Congdon, A. B., M. D., tuberculosis clinician

ARIZONA STATE BOARD OF HEALTH

Phoenix

State Superintendent of Public Health
  Fred P. Perkins, M. D., M. S. P. H.
  J D Dunshee, M D , assistant
Health Education
  Frank R Williams, B A , M S. P. H., director.
Laboratories
  Robert A Greene, B S , M S , P H. D., director
Local Health Administration.
  J. D Dunshee, M. D , director.
Maternal and Child Health
  Jack B Eason, B. S., M. D., M. S. P. H , director.
Nursing
  Jefferson I Brown, R N., C P H in Nursing, supervising nurse.
Sanitary Engineering
  F C Roberts, Jr., B S in C E , S B in S. E., C E. in C E , State sanitary engineer
Publications
  Arizona Public Health News—monthly
  Arizona Sewage and Water Works Bulletin—monthly.
  Annual Report of the Arizona State Board of Health.

ARKANSAS STATE BOARD OF HEALTH

Little Rock

State Health Officer:
  W. B. Grayson, B. S., M. D., F. A. C. P.
  T. T. Ross, M. D., M. P. H., assistant State health officer.
Communicable Disease Control, Division of·
  A. M. Washburn, M. D., M. P. H., director.
Dental Hygiene, Subdivision of·
  R. P. Spulin, D. D. S., director.
Laboratories, Bureau of:
  H. V. Stewart, M. D., director.
Local Health Service, Bureau of:
  T. T. Ross, M. D., M. P. H., director.
Malaria Investigations, Division of:
  S. J. Carpenter, B. S., M. S., acting director.
Maternal and Child Health, Division of:
  W. Myers Smith, M. D., M. P. H., director.
Milk Control, Division of:
  D. W. Jones, B. S in Agriculture, director.
Nursing.
  Margaret Vaughan, R N., B. S. in P. H. N., supervisor of nurses.
Sanitary Engineering, Bureau of.
  F. L. McDonald, C. E., M. S., M. S. in S. E., director.
Tuberculosis Control, Subdivision of:
  H. Lee Fuller, M. D., director.
Venereal Disease Control, Subdivision of:
  D W. Dykstra, M. D., M. P. H., director.
Vital Statistics, Bureau of
  Mrs. J. B. Collie, director.

CALIFORNIA STATE DEPARTMENT OF PUBLIC HEALTH

Sacramento

Administration:
- **Bertram P. Brown, M. D.,** director.
- Edward E. Johnson, assistant to the director.

Cannery Inspection, Bureau of:
- Milton P. Duffy, Ph. C., chief.

Child Hygiene, Bureau of:
- Ellen S. Stadtmuller, M. D., chief.

County Health Work, Bureau of:
- George M. Uhl, M. D., chief.

Crippled Children's Services:
- C. Martin Mills, M. D., chief.

Epidemiology, Bureau of:
- Harlin L. Wynns, M. D., chief.

Food and Drug Inspection, Bureau of:
- Milton P. Duffy, Ph. C., chief.

Industrial Hygiene Services:
- John P. Russell, M. D., chief.

Laboratories, Bureau of:
- Wilfred H. Kellogg, M. D., chief.

Public Health Nursing Services:
- Rona Haig, P. H. N., chief.

Sanitary Engineering, Bureau of:
- Chester G. Gillespie, C. E., chief.

Sanitary Inspections, Bureau of:
- Edward T. Ross, chief.

Tuberculosis, Bureau of:
- Edythe T. Thompson, A. B., chief.

Venereal Diseases, Bureau of:
- Malcolm H Merrill, M. D., chief.

Vital Statistics, Bureau of:
- Marie B. Stringer, M. S., State registrar.

Publications:
- California State Department of Public Health—weekly.
- California State Department of Public Health—biennially.

COLORADO STATE DIVISION OF PUBLIC HEALTH

Denver

Administration:
- **R. L. Cleere, M. D., M. P. H.,** secretary and executive officer.

Crippled Children, Division of:
- Maurice D. Vest, M D., M. P. H., director.

Dental Health, Subdivision of:
- Robert A. Downs, D. D. S., M. P. H., director.

Food and Drugs, Division of:
- Kenneth W. Lloyd, Ph. R., commissioner.

Laboratories, Division of·
- W C. Mitchell, M. D., director.

Maternal and Child Health, Division of·
- J. Burris Perrin, M. D., C. P. H., director.

Plumbing, Division of:
- Irving A. Fuller, chief plumbing inspector.

Public Health Nursing, Division of:
- Ruth E. Phillips, P. H. N., B. S., director.

Rural Health Work and Epidemiology, Division of:
- James S Cullyford, M. D., C P. H., director.

Sanitary Engineering, Division of:
- Benjamin V Howe, B. S., director.

Tuberculosis Control, Division of:
- Alfred R. Masten, M. D., M. P. H., director.

Venereal Disease Control, Division of:
- L J Lull, M. D., M. P. H., director.

Vital Statistics, Division of:
- Frank S. Morrison, LL. B., director.

Publications:
- Colorado State Board of Health Bulletin—bimonthly.
- Bulletin, Division of Public Health Nursing—monthly.
- Report of Colorado State Division of Public Health—biennially.

CONNECTICUT STATE DEPARTMENT OF HEALTH

Hartford

State Commissioner of Health:
- **Stanley H. Osborn, M. D., C. P. H.**

Cancer Research, Division of:
- Matthew H. Griswold, M. D., Dr. P. H., chief.

Child Hygiene, Bureau of:
- Martha L. Clifford, M. D., C. P. H., director.

Crippled Children, Division of·
- Louis Spekter, M. D., chief.

Laboratories, Bureau of:
- Friend Lee Mickle, M. S , Sc. D., director.

Licensure and Registration, Division of:
- Ruth H. Monroe, chief.

Local Health Administration, Division of:
- Franklin M. Foote, M. D , Dr. P. H., chief.

Mental Hygiene, Bureau of:
- James L. Cunningham, M. D., director.

Mouth Hygiene, Division of·
- Franklin M. Erlenbach, D. M. D., chief.

Occupational Diseases, Bureau of:
- Albert S. Gray, M. D., director.

Preventable Diseases, Bureau of·
- Millard Knowlton, M. D , C. P H., director.

Public Health Instruction, Bureau of
- Elizabeth C Nickerson, B. S., C. P H., director.

Public Health Nursing, Bureau of·
- Hazel V. Dudley, R. N., B. S., director.

Sanitary Engineering, Bureau of:
- Warren J. Scott, S. B., director.

Supplies, Division of:
- Lawrence A Fagan, chief.

Vital Statistics, Bureau of.
- William C. Welling, B. A., director.

Publications:
- Weekly Health Bulletin.
- Connecticut Health Bulletin—monthly.
- Annual Report of State Department of Health.
- Annual Vital Statistics Report.

DELAWARE STATE BOARD OF HEALTH

Dover

Executive Officer·
- **Edwin Cameron, M. D., C. M., M. P. H.**

Communicable Disease Control, Division of:
- Joseph R. Beck, M. D., director.

Maternal and Child Health·
- Floyd I Hudson, M. D., director.

Pathological and Bacteriological Laboratory.
- R. D. Herdman, B. S., bacteriologist.

Sanitation Division:
- R. C. Beckett, B. S. in S. E., State sanitary engineer.

Vital Statistics:
- Edwin Cameron, M. D., C. M., M. P. H., State registrar.

Publications:
- Morbidity Report—weekly.
- Delaware Health News—quarterly.
- Annual Report.

DISTRICT OF COLUMBIA HEALTH DEPARTMENT

Washington

Administration:
George C. Ruhland, M. D., health officer.
Daniel L. Seckinger, M. D., assistant health officer.
Food Inspection, Bureau of:
Reid R. Ashworth, D. V. S., director.
Laboratories, Bureau of:
John E. Noble, B. S., acting director.
Maternal and Child Welfare:
Ella Oppenheimer, M. D., director.
Medical and Sanitary Inspection of Schools:
Joseph A. Murphy, M. D., director.
Nursing, Bureau of:
Josephine Pittman Prescott, A. M., P. H. N. Certf., director.
Permit Bureau:
Richard F. Tobin, M. D., director.
Public Health Instruction, Bureau of:
Melvin P. Isaminger, Dr. P. H., director.
Preventable Diseases, Bureau of:
James G. Cumming, M. D., director.
Sanitation, Bureau of:
J. Frank Butts, director.
Social Hygiene, Bureau of:
George M. Leiby, M. D., director.
Social Service, Bureau of:
Lucia Murchison, M. A., director.
Tuberculosis, Bureau of:
*A. Barklie Coulter, M. D., director.
Vital Statistics, Bureau of:
Joseph B. Irvine, LL. M., director.
Publications:
Weekly report by health department.
Monthly statement of average grade of milk and ice cream sold.
Annual report by health officer.

FLORIDA STATE BOARD OF HEALTH

Jacksonville

Administration:
A. B. McCreary, M. D., A. B., executive secretary and State health officer.
Wm. H. Pickett, M. D., assistant State health officer.
Accounting, Division of:
G. Wilson Baltzell, director.
Dental Health, Bureau of:
Lloyd N. Harlow, D. D. S., director.
Drugs and Narcotics, Bureau of:
M. H. Doss, director.
Engineering, Bureau of:
G. F. Catlett, C. E., director.
Epidemiology, Bureau of:
Dan N. Cone, M. D., director.
Health Education, Bureau of:
Elizabeth Bohnenberger, director.
Laboratories, Bureau of:
J. N. Patterson, M. D., director.
Local Health Service, Bureau of:
L. J. Hanchett, M. D., director.
Malariologist:
L. L. Parks, M. D.
Maternal and Child Health, Bureau of:
W. H. Ball, M. D., director.
Public Health Nursing, Bureau of:
Ruth E. Mettinger, R. N., director.
Tuberculosis Field Unit:
A. J. Logie, M. D., director.
Venereal Disease Control, Division of:
L. C. Gonzalez, M. D., director.
Vital Statistics, Bureau of:
Edward M. L'Engle, M. D., director.
Publications:
Florida Health Notes—monthly.

GEORGIA DEPARTMENT OF PUBLIC HEALTH

Atlanta

Director:
T. F. Abercrombie, M. D., D. P. H.
Dental Health Education, Division of:
*J. G. Williams, D. D. S., director.
Information and Statistics, Division of:
D. M. Wolfe, M. D., D. P. H., director.
Laboratories, Division of:
T. F. Sellers, M. D., director.
Local Health Organization, Division of:
G. G. Lunsford, M. D., director.
Malaria and Hookworm Service, Division of:
Justin Andrews, Sc. D., director.
Maternal and Child Health, Division of:
Joe P. Bowdoin, M. D., director.
Preventable Diseases, Division of:
C. D. Bowdoin, M. D., D. P. H., director.
Public Health Engineering, Division of:
L. M. Clarkson, director.
Public Health Nursing, Division of:
Mrs. Abbie R. Weaver, R. N., director.
Tuberculosis Control, Division of:
H. C. Schenck, M. D., director.
Publications:
Georgia's Health—monthly.

TERRITORY OF HAWAII BOARD OF HEALTH

Honolulu

Territorial Commissioner of Public Health:
M. F. Haralson, M. D.
Richard K. C. Lee, M. D., Dr. P. H., deputy Territorial commissioner of public health.
Communicable Diseases, Bureau of:
James R. Enright, M. D., B. A., director.
Crippled Children, Bureau of:
Richard K. C. Lee, M. D., Dr. P. H., director.
Maternal and Infant Hygiene, Bureau of:
*O. Lee Schattenburg, M. D., B. A., acting director.
Mental Hygiene, Bureau of:
Edwin E. McNiel, M. D., A. B., director.
Public Health Nursing, Bureau of:
Mary Williams, B. S., P. H. N., director.
Pure Food and Drugs, Bureau of:
M. B. Bairos, A. B., director.
Sanitation, Bureau of:
S. W. Tay, B. S., director.
Tuberculosis, Bureau of:
C. Alvin Dougan, M. D., B. A., director.
Venereal Disease Control, Division of:
*Robert D. Millard, M. D., D. S., supervisor.
Vital Statistics, Bureau of:
M. Hester Lemon, registrar general.
Publications:
Annual Report, Board of Health, Territory of Hawaii.

IDAHO DEPARTMENT OF PUBLIC WELFARE, DIVISION OF PUBLIC HEALTH

Boise

Administration, Division of Public Health:
E. L. Berry, M. D., M. S. P. H., director.
Industrial Hygiene, Bureau of:
Max P. Schranck, M. D., director.
Laboratories, Subdivision of:
L. J. Peterson, M. S. P. H., director.
Maternal and Child Health and Crippled Children, Subdivision of:
G. H. Bischoff, M. D., director.
Public Health Nursing, Subdivision of:
Kathryn McCabe, R. N., P. H. N., director.
Sanitary Engineering, Subdivision of
W. V. Leonard, B. S., M. E., director.
Vital Statistics, Bureau of:
Mae G. Atwood, director.
Publications:
Public Welfare in Idaho—monthly.
Notifiable Disease Report—monthly.

ILLINOIS STATE DEPARTMENT OF PUBLIC HEALTH

Springfield

Director:
R. R. Cross, M. D.
Cancer Control, Division of:
R. V. Brokaw, M. D., chief.
Central Administration, Division of:
Wilbur Mirus, chief clerk.
Child Hygiene and Public Health Nursing, Division of:
Grace S. Wightman, M. D., chief.
Communicable Diseases, Division of:
J. J. McShane, M. D., Dr. P. H., chief.
Community Sanitation, Section of:
H. A. Bronson, C. E., senior sanitary engineer.
Dental Health Education, Division of:
C. F. Deatherage, D. D. S., M. P. H., chief.
Industrial Hygiene, Division of:
M. H. Kronenberg, M. D., B. S., chief.
Laboratories, Division of:
H. J. Shaughnessy, Ph. D., chief.
Local Health Administration, Division of:
Hugo V. Hullerman, M. D., M. S. P. H., chief.
Lodging House Inspection, Division of:
W. J. Costello, superintendent.
Pneumonia Control, Section of:
H. A. Lindberg, M. D., control officer.
Public Health Instruction, Division of:
B. K. Richardson, A. B., chief.
Sanitary Engineering, Division of:
C. W. Klassen, B. S., chief engineer.
Social Hygiene, Section of
H. M. Soloway, M. D., V. D. control officer.
Statistical Research, Section of:
L. A. Wilson, statistician
Vital Statistics, Division of:
R. H. Woodruff, M. D., acting registrar.
Publications
Illinois Health Messenger—biweekly.
Communicable Disease Reports—biweekly.
Health Officer's Bulletin—weekly.
Over the Spillway—quarterly.
The Digester—quarterly.
Time and Temperature—quarterly.
The New Swimmin' Hole—quarterly.
Annual Report.

INDIANA STATE BOARD OF HEALTH

Indianapolis

Administration.
J. W. Ferree, M. D., M. P. H., director.
Accounting, Bureau of
Carl F. King, LL. B., chief accountant.
Bacteriological Laboratory
*C. G. Culbertson, M. D., chief.
Communicable Diseases, Bureau of
J. W. Jackson, M. D., B. A., State epidemiologist.
Community Sanitation, Bureau of
Ralph W. Tusing, assistant State director.
Dairy Products, Bureau of:
John Taylor, B. S., M. S., chief.
Food and Drugs, Bureau of:
Joseph C. Schneider, A. B., chief.
Health and Physical Education, Bureau of.
*T. B. Rice, M. D., chief.
Industrial Hygiene, Bureau of:
Louis W. Spolyar, M. D., chief.
Legal Administration, Bureau of:
Charles L. Barry, Jr., LL. B., deputy attorney general.
Local Health Administration, Bureau of:
George M. Brother, M. D., M. P. H., chief.
Maternal and Child Health, Bureau of:
*Howard B. Mettel, M. D., chief.
Public Health Nursing, Bureau of:
Eva F. MacDougall, R. N., A. B., chief.
Sanitary Engineering, Bureau of:
B. A. Poole, B. S., C. E., chief engineer.
State Narcotics Inspection, Bureau of
Eugene W. Ryan, inspector in charge.
Venereal Diseases, Bureau of:
George W. Bowman, M. D., chief.
Vital Statistics, Bureau of:
H. M. Wright, chief.
Publications.
Monthly Bulletin of the Indiana State Board of Health.
Echoes—quarterly.
Sewage Gas—quarterly.

IOWA STATE DEPARTMENT OF HEALTH

Des Moines

Administration, Public Health:
Walter L. Bierring, M. D., F. A. P. H. A., F. A. C. P., Hon. R. C. P. Edin., commissioner.
Local Health Services:
Marvin F. Haygood, M. D., M. P. H., director.
Maternal and Child Health, Division of.
John M. Hayek, M. D., director.
Public Health Education, Division of.
Wm. W. Schultz, D. S. in J., director.
Public Health Engineering and Industrial Hygiene, Division of:
A. H. Wieters, B. S., M. S. San. Eng., director.
Paul Houser, B. S. Eng., associate director (Industrial Hygiene).
Public Health Nursing, Division of:
Edith S. Countryman, R. N., C. P. H., director.
Preventable Disease, Division of:
Carl F. Jordan, A. B., M. D., M. P. H., director.
State Hygienic Laboratories, Division of:
M. E. Barnes, M. D., Dr. P. H., director.
Tuberculosis Control, Division of:
Charles K. McCarthy, M. D., director.
Venereal Disease Control:
R. M. Sorensen, M.D., C. P. H., M. S., director.
Vital Statistics, Division of:
Eric P. Pfeiffer, M. D., C. P. H., director.
Publications:
Health Message—weekly.
Press releases.
Quarterly and special bulletins.
Biennial reports.

KANSAS STATE BOARD OF HEALTH

Topeka

Secretary and Executive Officer:
F. P. Helm, M. D.
Child Hygiene, Division of:
H. R. Ross, M. D., director.
Communicable Diseases, Division of:
C. H. Kinnaman, M. D., director.
Dental Hygiene, Division of:
Leon R. Kramer, M. P. H., D. D. S., director.
Food and Drugs, Division of:
Evan Wright, acting assistant chief.
Local Health, Division of:
R. F. Boyd, M. D., M. P. H., director.
Public Health Education, Division of.
Bertha Campbell, director.
Public Health Laboratories, Division of:
Chas. H. Hunter, Ph. D , director.
Sanitation, Division of·
Earnest Boyce, M. D., chief engineer.
Tuberculosis, Division of·
F. C. Beelman, M. D., director.
Venereal Diseases, Division of
Robert H. Riedel, M. D., M. P. H., director.
Vital Statistics, Division of·
Minnie Fleming, acting State registrar.
Publications:
Morbidity Report—weekly.
The News Letter—monthly.
Student Accidents—yearly.
Kansas Accidental Deaths—yearly.
The Biennial Report.

KENTUCKY STATE DEPARTMENT OF HEALTH

Louisville

State Health Commissioner·
A. T. McCormack, M. D., D. P. H.
P E Blackerby, assistant State health commissioner
Bacteriology, Bureau of·
Lillian H South, M D , director.
Budget, Bureau of
Elva Grant, director
Communicable Diseases, Division of·
Fred W Caudill, M D , C P H., director.
County Health Work, Bureau of·
P E. Blackerby, M D., director.
Dental Health, Bureau of:
*J F Owen, D D S., director
Epidemiology, Bureau of.
Fred W Caudill, M D , C P H , director.
Foods, Drugs and Hotels, Bureau of
Sarah Vance Duran, M S., director.
Maternal and Child Health, Bureau of
C B Crittenden, M D , M P H., director.
Mental Hygiene, Bureau of
O. M. Goodloe, M D , C. P H., acting director.
Public Health Education, Bureau of:
John W Kelly, M A , director.
Public Health Nursing, Bureau of
Margaret L East, R N , director.
Registration, Bureau of
A T McCormack, M. D , D. P. H., director.
Sanitary Engineering, Bureau of
F C Dugan, C. E., director.
Trachoma, Bureau of
Robert Sory, M D , director.
Tuberculosis, Bureau of
John B Floyd, M D., director.
Venereal Diseases, Bureau of:
Russell H Teague, M D., M P. H., director.
Vital Statistics, Bureau of.
J F Blackerby, director
Publications
Bulletin, State Department of Health—monthly.
Service Sifter—monthly
Vital Statistics Bulletin—yearly

LOUISIANA STATE BOARD OF HEALTH

New Orleans

President, State Board of Health:
John H. Musser, M. D.
Administrative Service, Bureau of:
S. C. Newitt, director
Parish Health Administration:
Ford Williams, M. D., director.
Crippled Children, Division of:
W. L Treuting, M. D
Maternal and Child Health, Division of·
Virginia Webb, M. D.
Tuberculosis Control, Division of
Alec Brown, M. D.
Parish Health Administration—Continued
Venereal Disease Control, Division of·
A. B Price, M. D.
Public Health Engineering and Sanitation, Bureau of:
John H. O'Neill, B S., sanitary engineer.
Vital Statistics, Bureau of.
Mrs L Wilson, acting registrar.
Publications.
Morbidity Report—weekly.
Quarterly Bulletin.

MAINE DEPARTMENT OF HEALTH AND WELFARE—BUREAU OF HEALTH

Augusta

Director of Health:
Roscoe L. Mitchell, M. D.
Communicable Diseases, Division of:
R. L. Mitchell, M. D., acting director.
Dental Health, Division of:
P. W. Woods, D. D. S., M.P. H., M. S. D., A. B., director.
Diagnostic Laboratories, Division of:
A. H. Morrell, M. D., director.
Maternal and Child Health, Division of:
C. N. Stanhope, M. D., acting director.
Public Health Nursing, Division of:
Helen F. Dunn, R. N., director.
Sanitary Engineering, Division of:
E. W. Campbell, B. S., C. P. H., D. P. H., director.
Venereal Disease Control, Division of:
*Oscar R. Johnson, M. D., acting director.
Vital Statistics, Division of:
P. B. Stinson, A. B., director.
Publications:
Vital Statistics Report—yearly.

MARYLAND STATE DEPARTMENT OF HEALTH

Baltimore

Director:
Robert H. Riley, M. D., Dr. P. H.
Bacteriology, Bureau of:
C. A. Perry, Sc. D., chief.
Chemistry, Bureau of:
W. F. Reindollar, Sc. D., chief.
Child Hygiene, Bureau of:
J. H. M. Knox, Jr., M. D., chief.
Communicable Diseases and Services for Crippled Children, Bureau of:
Charles H. Halliday, M. D., chief and epidemiologist.
Food and Drugs, Bureau of:
A. L. Sullivan, B. S., commissioner.
Legal Administration, Division of.
J. Davis Donovan, LL. B., Chief.
Oral Hygiene, Division of:
R. C. Leonard, D. D. S., chief.
Personnel and Accounts, Division of:
W. N. Kirkman, chief.
Public Health Education, Division of:
Gertrude B. Knipp, A. B., chief.
Public Health Nursing, Division of:
Catherine Corley, R. N., nurse-instructor.
Sanitary Engineering, Bureau of:
G. L. Hall, chief.
Vital Statistics, Bureau of:
A. W. Hedrich, Sc. D., chief.
Publications.
Weekly Press Bulletin.
Monthly Bulletin.
Annual Report.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

Boston

State Commissioner:
Paul J. Jakmauh, M. D.
Deputy Commissioner.
Alton S. Pope, M. D.
Administration, Division of.
Paul J. Jakmauh, M. D., director.
*Edward G. Huber, M D., assistant director.
Adult Hygiene, Division of:
Herbert L. Lombard, M D, director.
Biologic Laboratories, Division of.
Elliott S. Robinson, M D., director.
Child Hygiene, Division of:
M Louise Diez, M. D, director.
Communicable Diseases, Division of:
Roy F. Feemster, M. D, director.
Food and Drugs, Division of:
Hermann C. Lythgoe, B. S., director.
Genitoinfectious Diseases, Division of.
Nels A. Nelson, M. D, director.
Sanitary Engineering, Division of.
Arthur D. Weston, director.
Tuberculosis, Division of:
Alton S. Pope, M. D., director.
Publications
Cancer Bulletin- monthly.
Bulletin of Genitoinfectious Diseases—monthly.
News Letter to Board of Health—bimonthly.
Contact—quarterly.
The Commonhealth—semiannually.
Annual Report

MICHIGAN DEPARTMENT OF HEALTH

Lansing

Commissioner:
H. Allen Moyer, M. D.
Carleton Dean, M D, M. P. H., deputy State health commissioner.
Education, Bureau of
Marjorie Delavan, A B., director.
Engineering, Bureau of:
John M. Hepler, C. E., director.
Epidemiology, Bureau of:
A W Nowitt, M. D., M. P. H., director.
Industrial Hygiene, Bureau of:
K. E Markuson, M. D., M. P. H., director.
Laboratories, Bureau of:
C C Young, D. P. H., Ph. D., director.
Local Health Services, Bureau of:
Carleton Dean, M. D, M. P. H., director.
Maternal and Child Health, Bureau of:
Lillian R Smith, M. D, director.
Public Health Dentistry, Bureau of
William R. Davis, D D. S., director.
Public Health Nursing, Bureau of.
Helene B Buker, R N, M A, director.
Records and Statistics, Bureau of.
Stuart T. Friant, director.
Publications
Statistical Report of Communicable Diseases—weekly.
Michigan Public Health—monthly.
Interdepartmental Circular—monthly.
Statistical Report, Bureau of Records and Statistics—yearly.
Annual Report.

MINNESOTA DEPARTMENT OF HEALTH

St. Paul

Secretary and Executive Officer:
A. J. Chesley, M. D.
Administration, Division of:
O. C. Pierson, director.
Birth and Death Records and Vital Statistics, Division of:
Gerda C. Pierson, director.
Child Hygiene, Division of.
Viktor O. Wilson, M. D., M. P. H., director.
Dental Health Education:
Verh D. Irwin, D. D. S., P. H. dentist in charge.
Hotel Inspection, Division of:
Theo. T. Wold, director.
Industrial Hygiene:
Leslie W. Foker, M. D., M P. H., P. H. physician in charge.
Influenza Research Laboratory:
Clara Nigg, Ph. D, bacteriologist in charge.
Local Health Services, Division of:
R. N. Barr, M. D., M. P. H., director.
Preventable Diseases, Division of:
O. McDaniel, M. D., director.
Public Health Education:
Donald A. Dukelow, M. D., M. S., P. H. physician in charge.
Public Health Nursing, Division of:
Olivia T. Peterson, R. N., director.
Sanitation, Division of:
H. A. Whittaker, B. A., director.
Venereal Disease Control:
Ralph R. Sullivan, M. D., assistant director in charge.

MISSISSIPPI STATE BOARD OF HEALTH

Jackson

Administration:
Felix J. Underwood, M. D., secretary and executive officer.
*R. N. Whitfield, M. D., assistant secretary.
County Health Work:
J. A. Milne, M. D., M. P. H., director.
Field Unit:
H. B. Cottrell, M. D., C. P. H., supervisor.
Health Education:
Eleanor Hassell, B. A., supervisor.
Industrial Hygiene and Factory Inspection:
J. W. Dugger, M. D., director.
Laboratories:
H. C. Ricks, M. D., M. P. H., director.
Library:
Louise Williams, librarian.
Malaria Control:
Geo E Riley, M. D., C. P. H., supervisor.
Maternal and Child Health:
J. A. Milne, M. D., M. P. H., acting director.
Milk Sanitation:
N. M. Parker, D. V. M., supervisor.
Mouth Hygiene:
Gladys Eyrich, B. L., supervisor.
Preventable Disease Control:
A. L. Gray, M. D., M. P. H., director.
Public Health Engineering:
H. A. Kroeze, C. E., director.
Public Health Nursing:
Mary D. Osborne, R. N., supervisor.
Tuberculosis State Sanatorium:
Henry Boswell, M. D., F. A. C. P., director.
Venereal Disease Control:
D. V. Galloway, M. D., M. P. H., supervisor.
Vital Statistics:
R. N. Whitfield, M. D., director.
Publications:
Biennial Report.

MISSOURI STATE BOARD OF HEALTH

Jefferson City

State Health Commissioner:
Harry F. Parker, M. D.
John W. Williams, Jr., M. D., M. P. H., assistant health commissioner.
Business Administration, Division of:
W. H. Dorsey, administrator.
Child Hygiene, Division of
James W Chapman, M D., director.
Cosmetology, Division of.
Julia Edgmon, acting director.
Food and Drugs, Division of
Harry H. Harnsberger, director.
Laboratories, Division of
C. F. Adams, M. D., director.
Local Health Work, Division of
John W. Williams, Jr., M. D , M. P. H., director.
Pneumonia Control·
W. H. Aufranc, M. D., director.
Public Health Dentistry:
Allen Gruebbel, D. D. S., M. P. H., director.
Public Health Education.
J. S. Rollins, LL. D , director.
Public Health Engineering, Division of:
W. Scott Johnson, B. S , M S , chief.
Public Health Nursing, Division of.
Helena Dunham, director.
Venereal Disease Control·
Asa Barnes, M D , M. P. H., director.
Vital Statistics, Division of:
Thos. W. Chamberlain, director.
Publications:
Morbidity Report—weekly.
Monthly Report.
Annual Report.

MONTANA STATE BOARD OF HEALTH

Helena

Administration:
W. F. Cogswell, M. D., C. M., secretary and executive officer
Communicable Disease, Division of
B. K. Kilbourne, M. D., epidemiologist.
Food and Drug, Division of.
J. W. Forbes, B. S., director.
Hygienic Laboratory:
Edith Kuhns, B S., director.
Industrial Hygiene, Division of
L M Farner, M. D , A. B., C. P. H., director.
Maternal and Child Health, Division of.
Edythe P. Hershey, M. D., B. S., director.
Rural Health Work:
B K Kilbourne, M. D., director.
Vital Statistics, Division of:
L. L. Benepe, B. S , deputy State registrar.
Water and Sewage, Division of:
H. B. Foote, B. A., A. M., C. E., director.
Publications·
Report of Communicable Diseases—weekly.
Biennial Report of State Board of Health.
Public Health Nursing Notes—monthly.
Health-in-Education Leaflets—quarterly.

NEBRASKA STATE DEPARTMENT OF HEALTH

Lincoln

Acting Director of Health·
P. H. Bartholomew, M. D.
Community Sanitation.
Harry F. Glynn, assistant director.
Dental Hygiene, Division of
J R. Thompson, D. D. S , M. P. H , director.
Laboratory, Division of·
L. O Vose, M. S., P. H. E., director.
Maternal and Child Health, Division of:
R. H. Loder, M. D., director.
Public Health Engineer:
T. A. Filipi, M. S.
Public Health Nursing Consultant:
Eleanor Palmquist, R. N.
Tuberculosis, Survey of Human:
E. A. Rogers, M. D., director.
Venereal Disease, Division of:
R. A. Frary, M D , assistant epidemiologist.
Vital Statistics, Division of:
Jean Barrett, A. B., registrar.

NEVADA STATE DEPARTMENT OF HEALTH

Carson City

State Health Officer:
Edward E. Hammer, M. D.
Community Sanitation Program:
Webster B. Hunter, B. S., district supervisor.
Dental Hygiene, Division of:
Robert F. O'Brien, D. D. S., director.
Laboratories, Division of:
Vera E Young, M. A. in P. H., director.
Local Health Administration and Epidemiology, Division of
Gerald J. Sylvain, M. D., M. P. H., director and State epidemiologist.
Maternal and Child Health and Crippled Children's Services, Division of:
Wm. Morse Little, M. D., director.
Public Health Engineering, Division of:
W. W. White, E. M., C. P. H., director.
Tuberculosis Control Program:
Edward E. Hammer, M. D., director.
Venereal Disease Control, Division of:
*Byron H. Caples, M. D., director.
Vital Statistics, Division of:
John J. Sullivan, Jr., M. P. H., director.
Publications·
State Department of Health Biennial Report.

NEW HAMPSHIRE STATE BOARD OF HEALTH

Concord

Secretary and Executive Officer
Travis P. Burroughs, M. D., A. B., M. P. H.
Chemistry and Sanitation, Division of
Charles D Howard, S B , director
Crippled Children's Services, Division of
Mary M Atchison, M D , A B , director.
Epidemiology and Local Health Work, Division of
Mary M Atchison, M D , A B , acting director.
Laboratory of Hygiene
Travis P Burroughs, M. D , A. B , M. P H , director.
Maternal and Child Health, Division of·
Mary M Atchison, M D , A B , director
Public Health Nursing, Division of
Mary D Davis, R N , director
Venereal Disease Control, Division of
Alfred L Frechette, M D , director
Vital Statistics, Department of
Travis P Burroughs, M D., A. B., M P H., registrar
Publications
New Hampshire Health News– monthly.
Registration Report – biennially
Report of the State Board of Health– biennially

NEW JERSEY STATE DEPARTMENT OF HEALTH

Trenton

Director
J. Lynn Mahaffey, M. D.
Administration, Bureau of
E R Outcalt, chief
Bacteriology, Bureau of
John Mulcahy, chief.
Chemistry, Bureau of
John E Bacon, C H E , chief.
Dental Health Program·
J M. Wisan, D D S , consultant.
Engineering, Bureau of
Harry P Croft, C. E , chief.
Food and Drugs, Bureau of
Walter W Scofield, B. A., B. S , chief
Local Health Administration, Bureau of
William H. MacDonald, B L , M S , chief.
Maternal and Child Health, Bureau of·
*Julius Levy, M D., consultant
Milk Sanitation
I H Shaw, D. V. M , veterinarian.
Negro Health Program.
J Earl Stuart, M D , consultant
Public Health Nursing, Advisory Service
Elizabeth Curtis, R N , consultant.
Shellfish Sanitation
Edwin O Applegate, B S , senior chemist
Venereal Disease Control Division of
Daniel Bergsma, M D , P H chief
Vital Statistics, Bureau of
Walter R Scott, chief
Publications
Public Health News - bimonthly.
Annual Report of the Department of Health of the State of New Jersey.

NEW MEXICO DEPARTMENT OF PUBLIC HEALTH

Santa Fe

Administration, Division of·
James R. Scott, M. D., Ph. D., director.
County Health Administration, Division of
C H Douthirt, M. D., director.
Engineering Division:
Paul S Fox, B S., M. S., C. E , public health engineer.
Maternal and Child Health, Division of:
Hester B Curtis, M D., M. P H., director.
Public Health Laboratory, State·
Myrtle Greenfield, M. A., director.
Public Health Nursing, Division of:
Fannie T Warncke, director.
Venereal Disease Control, Division of
E F. McIntyre, M. D , C. P. H., director.
Vital Statistics, Division of.
Billy Tober, State registrar.
Publications
Morbidity Statistics Bulletin—weekly.
Vital Statistics Bulletin—monthly.
The New Mexico Health Officer—quarterly.

NEW YORK STATE DEPARTMENT OF HEALTH

Albany

Commissioner:
Edward S. Godfrey, Jr., M. D.
Paul B Brooks, M. D., deputy commissioner.
Accounts, Division of:
Clifford C. Shoro, director.
Administrative Officer:
Edmund Schreiner, LL. B.
Cancer Control, Division of:
Louis C. Kress, M. D , director.
Communicable Diseases, Division of:
James E. Perkins, M. D., director.
Embalming and Undertaking, Bureau of:
Grace Haswell, principal clerk.
Laboratories and Research, Division of
Augustus B. Wadsworth, M. D., director.
Local Health Administration·
V. A. Van Volkenburgh, M. D , assistant commissioner.
Malignant Diseases, State Institute for Study of:
Burton T. Simpson, M D , director.
Maternity, Infancy and Child Hygiene, Division of.
Elizabeth M. Gardiner, M. D , director.
Narcotic Control, Bureau of
Frank J. Smith, Ph G , supervisor.
Orthopedics, Division of:
Walter J. Craig, M. D., director.
Pneumonia Control, Bureau of:
Edward S. Rogers, M. D., chief.
Public Health Education, Division of:
Burt R. Rickards, S B., director.
Public Health Nursing, Division of·
Marian W. Sheahan, R. N., director.
Sanitation, Division of.
Charles A. Holmquist, S. B., director.
Syphilis Control, Division of·
William A. Brumfield, M. D., director.
Tuberculosis, Division of.
William Siegal, M. D., director.
Tuberculosis Hospitals
Robert E. Plunkett, M. D., general superintendent.
Vital Statistics, Division of:
J. V. DePorte, Ph. D., director.
Publications
Health News—weekly
Vital Statistics Review—monthly.
Annual Report.

NORTH CAROLINA STATE BOARD OF HEALTH

Raleigh

Secretary and State Health Officer:
Carl V. Reynolds, M. D.
G M Cooper, M. D , assistant state health officer.
County Health Work, Division of·
R E. Fox, M D., director
Epidemiology and Venereal Disease Control, Division of·
J. C. Knox, M. D., director
Health Education, Crippled Children's Work, Maternal and Child Health Service, Division of:
G M Cooper, M D , director
Industrial Hygiene, Division of
T. F Vestal, M. D , director.
Laboratories, Division of
John H. Hamilton, M. D., director.
Oral Hygiene, Division of
Ernest A. Branch, D. D. S., director.
Sanitary Engineering and Malaria Control, Division of·
Warren H. Booker, C. E , director.
School Health Coordinating Service, Division of:
Walter Wilkins, M. D , Coordinator.
Vital Statistics, Division of.
R. T Stimpson, M D , director.
Publications
The Health Bulletin—monthly.

NORTH DAKOTA STATE DEPARTMENT OF HEALTH

Bismarck

Administration, Division of
Maysil M. Williams, M. D., C. P. H., State health officer.
Child Hygiene, Division of
Viola Russell, M. D., director.
Laboratories, Division of.
Melvin E Koons, M. S., C. P. H., director.
Local Health Work, Division of:
D. R. Gillespie, M. D., director.
Preventable Diseases, Division of·
Frank J. Hill, M. D , director.
Sanitary Engineering, Division of:
Lloyd K. Clark, C. E , B. S., director.
Vital Statistics, Division of
Margaret D. Lang, B. S., director.
Publications·
North Dakota's Health—weekly.
Biennial Report.

OHIO DEPARTMENT OF HEALTH

Columbus

State Director of Health:
R. H. Markwith, M. D.
James E. Bauman, assistant.
Adult Hygiene Division.
Lloyd H. Gaston, M. D.
Audits and Statistics Division:
Harry C. Eader, chief.
Child Hygiene Division:
A. W. Thomas, M. D., chief.
Dental Division:
H. B. Millhoff, D. D. S., chief.
Engineering Division·
F. H Waring, B. S. San. E., B. S., C. E., chief.
Laboratory Division:
Leo Ey, chief.
Legal Division·
James E. Bauman, chief.
Nursing Division:
Gertrude Bush, R. N., chief.

OKLAHOMA STATE DEPARTMENT OF PUBLIC HEALTH

Oklahoma City

Commissioner:
Grady F. Mathews, M. D.
J. P. Folan, assistant
J. A. Morrow, M. D., deputy.
Accounting:
J. P. Bailey, auditor.
Epidemiology.
J. Y. Battenfield, M. D., director.
Food and Drug Division.
J. P. Folan, director.
Health Education.
Hugh Payne, director.
Laboratories:
Wm. D. Hayes, Dr. P. H., director.
Local Health Service, Bureau of.
J. W. Shackelford, M. D., M. P. H., director.
Malaria Control and Community Sanitation:
Emil L. Baldwin, director.
Maternal and Child Health:
J. T. Bell, M. D., director.
Milk Control:
Wm. J. Wyatt, B. S., specialist.
Nutritionist
Maxine Turner, B. S.
Preventive Dentistry:
F. P. Bertram, D. D. S., director.
Public Health Engineering:
H. J. Darcey, B. S., director.
Public Health Nursing
Josephine L. Daniel, R. N., B. S., director.
Technical Field Unit.
John F. Hackler, M. D., M. P. H., director.
Tuberculosis Control.
R. H. Gingles, M. D., director.
Venereal Disease Control:
Eugene A. Gillis, M. D., M. P. H., director.
Vital Statistics:
Clyde F. Ross, LL. D., director.
Publications:
The Bulletin of the State Health Department—monthly
Annual Report.

OREGON STATE BOARD OF HEALTH

Portland

State Health Officer
Frederick D. Stricker, M. D.
Bedding and Upholstery Inspector:
Allen French
Cancer Control, Division of
*Raymond Watson, M. D., director.
County Health Units, Division of:
A. Edward Bostrom, M. D., director.
Dental and Oral Hygiene, Division of
Floyd H. DeCamp, D. D. S., consultant.
Hygienic Laboratory:
Wm. Levin, Dr. P. H., director
Maternal and Child Hygiene, Division of
Harold M. Erickson, M. P. H., director
Plumbing Inspector:
Arthur J. Farrell.
Public Health Education, Division of.
Ethel Mealey, M. A., consultant.
Public Health Nursing, Division of
Lucile Perozzi, M. A., director
Sanitary Engineering, Division of
Earl E. Green, C. E., director.
Tourist Campground Inspector
A. R. Ashton
Venereal Disease Control, Division of:
Sam D. Allison, M. D., director.
Vital Statistics, Division of
Deward Waggoner, M. S. P. H., assistant registrar
Publications
Weekly Bulletin

PENNSYLVANIA DEPARTMENT OF HEALTH

Harrisburg

Secretary:
John J. Shaw, M. D.
A. H. Stewart, M. D., deputy.
Accounts, Division of:
E. J. MacNamara, chief.
Comptroller:
C. T. Williams
Health Conservation, Bureau of:
J. Moore Campbell, M. D., director.
Maternal and Child Health, Bureau of:
Paul Dodds, M. D., director
Milk Sanitation, Bureau of
Ralph Irwin, director.
Public Health Nurses, Bureau of:
Alice O'Halloran, R. N., director.
Sanitary Engineering, Bureau of
W. L. Stevenson, C. E., director.
Tuberculosis Control, Bureau of
Chas. R. Reynolds, M. D., director.
Vital Statistics, Bureau of
Tom E. Williams, director.
Publications
Pennsylvania's Health—monthly

PHILIPPINE ISLANDS BUREAU OF HEALTH

Manila

Director
Eusebio D. Aguilar, M. D.
Administration, Division of:
Felipe Arenas, M. D., C. P. H., chief.
Epidemiology, Division of:
Jose Gindote, M. D., C. P. H., chief.
Hospitals, Division of
Sulpicio Chiyuto, M. D., chief.
Maternal and Child Hygiene, Division of:
Enrique F. Ochoa, M. D., C. P. H., chief.
National Charity Clinics:
Vicente Kierulf, M. D., medical supervisor.
Sanitation, Division of:
Gabriel Intengan.
Publications
Annual Report of the Office of the Commissioner of Health and Welfare.
Annual Report of the Bureau of Health.
Monthly Bulletin of the Bureau of Health.
The "Health Messenger" of the Bureau of Health—monthly.

PUERTO RICO DEPARTMENT OF HEALTH

San Juan

Commissioner of Health:
E. Garrido Morales, M. D., Dr. P. H.
Antonio Arbona, M. D., assistant commissioner, Section of Public Health.
Pedro S. Malaret, M. D., assistant commissioner, Section of Public Welfare.
Biological Laboratory:
O. Costa Mandry, M. D., C. T. M., director.
Chemical Laboratory:
Rafael del Valle Sárraga, Ph. D., director.
Epidemiology and Vital Statistics, Bureau of:
Abel de Juan, M. D., C. P. H., chief.
Foods and Drugs, Division of:
José Rivera Mundo, Ph. G., chief.
General Inspection of Construction and Plumbing, Bureau of
José Cantellops, S. E., chief
General Sanitary Inspection, Bureau of:
W. F. Lippitt, M. D., chief
Maternal and Infant Hygiene, Bureau of:
Marta Robert, M. D., chief.
Milk Supply, Division of:
Félix Lamela, chief.
Property and Accounts, Division of:
Rafael M. Méndez, Ph. G., chief.
Public Health Units, Bureau of:
José Chaves, M. D., chief.
Rural Medical Centers, Division of:
Ramón Berríos, M. D., chief.
Sanitary Engineering, Bureau of:
Juan G. Figueroa, C. E., acting chief.
Social Welfare, Bureau of:
Beatriz Lassalle, chief.
Tuberculosis, Bureau of:
J. Rodríguez Pastor, M. D., chief.
Venereal Diseases, Division of:
Ernesto Quintero, M. D., chief.
Publications.
Puerto Rico Health Bulletin—monthly.

RHODE ISLAND DEPARTMENT OF HEALTH

Providence

Director
Lester A. Round, Ph. D., State registrar.
Administration, Division of
Edward P. Conaty, Ph. B., business manager.
Crippled Children, Division of
*William A. Horan, M. D., chief
Examiners, Division of
E. Clyde Thomas, acting chief.
Laboratories, Division of
Edgar J. Staff, A. M., M. Sc., chief
Maternal and Child Health, Division of:
Francis V. Corrigan, M. D., chief
Narcotic Drugs and Pharmacies, Division of:
Joseph J. Cahill, drugs control administrator.
Preventable Diseases, Division of:
Harry B. Neagle, M. D., M. P. H., epidemiologist
Sanitary Engineering, Division of:
Charles L. Pool, M. Sc., chief.
State Sanatorium, Division of:
Ubaldo E. Zambarano, M. D., superintendent.
Vital Statistics, Division of:
Genevieve E. Dolan, assistant State registrar.
Publications:
Annual Report.
Registration Report—yearly.

SOUTH CAROLINA STATE BOARD OF HEALTH

Columbia

State Health Officer:
James A. Hayne, M. D.
Administration, Division of:
James A. Hayne, M. D.
Cancer Control, Division of
C. L. Guyton, M. D., director.
Communicable Diseases, Division of:
G. E. McDaniel, M. D., director.
Crippled Children, Division of:
H. G. Callison, M. D., director.
Dental Division
G. A. Bunch, D. D. S., director.
Hygienic Laboratory:
H. M. Smith, M. D., director.
Industrial Hygiene, Division of.
Harry F. Wilson, M. D., director.
Maternal and Child Health, Division of:
R. W. Ball, M. D., director.
Rural Sanitation and County Health Work:
Ben F. Wyman, M. D., director.
Tuberculosis Sanatorium.
Col. Wm. F. Moncrief, M. D., superintendent.
Venereal Disease Control:
Sedgwick Simons, M. D., director.
Vital Statistics Department:
M. B. Woodward, M. D., assistant State registrar.
Publications:
Annual Report.

SOUTH DAKOTA STATE BOARD OF HEALTH

Pierre

State Health Officer:
J. F. D. Cook, M. D., F. A. C. S.
G. J. VanHeuvelen, M. D., M. P. H., assistant.
Administration, Division of.
J. F. D. Cook, M. D., F. A. C. S., superintendent.
Epidemiology and Venereal Diseases, Division of:
G. J. VanHeuvelen, M. D., M. P. H., director.
Laboratories, Division of:
*J. C. Ohlmacher, M. D., director.
Maternal and Child Health, and Crippled Children, Division of:
A. Triolo, M. D., M. P. H., director.
Medical Licensure, Division of:
J. F. D. Cook, M. D., F. A. C. S., superintendent.
Public Health Nursing, Division of:
Alice Olson, R. N., director.
Records and Accounts, Division of:
Esther Kempter, auditor and chief clerk.
Sanitary Engineering, Division of:
W. W. Towne, C. E., M. S., director.
Vital Statistics, Division of:
J. F. D. Cook, M. D., F. A. C. S., special agent.
Publications:
Epidemiology Report—weekly.
The Clarifier—monthly.
Vital Statistics Report—monthly.
Annual Report (Vital Statistics).
Annual Report (All Divisions).

TENNESSEE DEPARTMENT OF PUBLIC HEALTH

Nashville

Commissioner:
W. C. Williams, M. D., C. P. H.
Laboratories, Division of:
Geo. M. Cameron, Ph. D., acting director.
Local Health Service:
Monroe F. Brown, M. D., C. P. H., acting director.
Preventable Diseases, Division of:
C. B. Tucker, M. D., C. P. H., director.
Sanitary Engineering, Division of:
Howard D. Schmidt, B. E., director.
Tuberculosis Control, Division of:
R. S. Gass, M. D., C. M., director.
Vital Statistics, Division of:
Don C. Peterson, M. D., C. P. H., acting director.

Publications:
Health Briefs—monthly.
Monthly News Letter.
Morbidity Statistics—monthly.
Annual Report of the Department of Public Health.
Vital Statistics Bulletin—yearly.
Morbidity Bulletin—yearly.
Annual Health Works' Conference Proceedings.
Biennial Report of the Department of Public Health.

TEXAS STATE DEPARTMENT OF HEALTH

Austin

State Health Officer:
Geo. W. Cox, M. D.
Community Sanitation and Malaria Control:
L. J. Trotti, B. S., assistant State supervisor.
Dental Hygiene Division:
Edward Taylor, D. D. S., director.
Engineering, Bureau of:
V. M. Ehlers, C. E., director
Food and Drugs, Bureau of
F. D. Brock, Ph.G., director.
Industrial Hygiene Division:
C. A. Nau, M. A., M. D., director.
Laboratories, Bureau of:
S. W. Bohls, M. D., director.
Local Health Services:
G. W. Luckey, M. D., director.
Malaria Investigation Division
C. P. Coogle, M. D., Ph. G., director.
Maternal and Child Health
J. M. Coleman, M. D., M. P. H., director.
Public Health Education:
L. E. Bracy, B. A., director.
Tuberculosis Division:
H. E. Smith, M. D., director.
Venereal Disease Division:
A. M. Clarkson, M. D., M. P. H., director.
Vital Statistics, Bureau of:
W. A. Davis, M. D., director.
Publications
Morbidity Statistics Bulletin—weekly.
News Letter—weekly.
The Bulletin—monthly.
Good Morning Judge—monthly.
In the Swim—monthly.
Quarterly Reports.
Annual Reports
Biennial Reports.

UTAH STATE BOARD OF HEALTH

Salt Lake City

Acting State Health Commissioner:
Wm. M. McKay, M. D., M. P. H.
Comptroller and Personnel Director.
T. K. Callister, M. B. A.
Crippled Children's Service, Division of
A. C. Thurman, M. D., C. P. H., director.
Dental Health, Division of:
R. C. Dalgleish, D. D. S., director.
Engineering and Sanitation, Division of:
Lynn M. Thatcher, B. S., director.
Epidemiology
Wm. M. McKay, M. D., M. P. H., director.
Fiscal Officer
Verna Durrant.
Industrial Hygiene, Division of:
J. L. Jones, M. D., Dr. P. H., director
Laboratories, Division of
E. H. Bramhall, B. S., director
Local Health Administration, Division of:
D. D. Carr, M. D., C. P. H., director.
Maternal and Child Health, Division of:
Lela J. Beebe, M. D., director.
Public Health Nursing, Division of:
Vera Klingman, P. H. N., B. S., director.
Venereal Disease Control, Bureau of:
W. W. Bigelow, M. D., C. P. H., director.
Vital Statistics, Division of:
Eva W. Ramsey, director and deputy State registrar.
Publications:
Communicable Disease Report—weekly.
"MCH News Letter"—monthly.
Utah Health Bulletin—quarterly.

VERMONT DEPARTMENT OF PUBLIC HEALTH

Burlington

Secretary and Executive Officer:
C. F. Dalton, M. D.
Communicable Diseases and Venereal Disease Control Division
F. S. Kent, M. D., director.
Crippled Children's Division:
Lillian E. Kron, R. N., director.
Laboratory of Hygiene:
C. F. Whitney, M. D., director.
Maternal and Child Health Division:
Paul D. Clark, M. D., director.
Public Health Nursing:
Nellie M. Jones, R. N., director.
Sanitary Engineering:
E. L. Tracy, C. E., director.
Tuberculosis and Industrial Hygiene Division:
H. W. Slocum, A. B., director.
Publications:
Modern Health Crusader—five times a year
Biennial Report.

VIRGIN ISLANDS DEPARTMENT OF HEALTH

Charlotte Amalie

Commissioner of Health, Chief Municipal Physician, and Registrar, St Thomas:
Knud Knud-Hansen, M. D., F. A. C. S.
Assistant Commissioner of Health, Chief Municipal Physician, and Registrar, St. Croix.
Meredith Hoskins, M. D.
Sanitation Service, St Thomas:
Cyril Creque, chief clerk.
Publications
Report of Notifiable Diseases—monthly.

VIRGINIA STATE DEPARTMENT OF HEALTH

Richmond

Administration
I. C. Riggin, M. D., State health commissioner.
Communicable Diseases, Bureau of
William Grossmann, M. D, director
Crippled Children's Bureau
E C. Harper, M D, director.
Health Education, Bureau of.
J C Funk, Sc D, director
Industrial Hygiene, Bureau of
J B Porterfield, M D, director
Laboratories, Bureau of
Adah Corpening, director
Maternal and Child Health, Bureau of·
A L. Carson, M D, director
Mouth Hygiene, Division of
N. T Ballou, D. D. S., director.
Public Health Nursing, Bureau of:
Mary I Mastin, R N, director.
Rural Health, Bureau of
L J Roper, M D, director
Sanitary Engineering, Bureau of
Richard Messer, C E, director.
Tuberculosis Out-Patient Service
E C Harper, M D, director.
Venereal Disease Control, Division of:
E M Holmes, Jr, M. D., director.
Vital Statistics, Bureau of
W A. Plecker, M. D., registrar.
Publications
Health Bulletin—monthly.

WASHINGTON STATE DEPARTMENT OF HEALTH

Seattle

Director·
Donald G. Evans, M. D., B. S., M. P. H., D. P. H.
R. H Fletcher, M. D, B S, M P H., assistant director, in charge of local health work.
Epidemiology, Division of
L. A. Dewey, M. D, B Sc., D. P. H., chief.
Health Education, Division of.
Charles Hilton, M A, chief.
Laboratory, Division of
A. U. Simpson, M D, B S, chief
Maternal and Child Hygiene, Division of·
Percy F. Guy, M D, M P H., chief
Public Health Engineering, Division of:
Roy Harris, B S, C E, M. S, chief.
Public Health Nursing, Division of·
Mary Coolidge, A. B., R. N., C. P. H. N., acting chief
Vital Statistics, Division of:
Francis Rhoads, A. B, M. A., C. P. H., chief and State registrar.
Publications
Weekly Communicable Disease Report
Water Supply and Sewage News—bimonthly.
Statistical Bulletin—bimonthly.
Annual Report

WEST VIRGINIA STATE HEALTH DEPARTMENT

Charleston

Commissioner·
Arthur E. McClue, M. D., B. S.
Barbers and Beauticians, Bureau of
E L Peters, director.
Communicable Diseases, Division of
Albert M. Price, M D, C. P H, director.
County Health Work, Bureau of:
Bruce H. Pollock, M. D., A. B., C. P. H., director.
Dental Hygiene, Bureau of.
Russell K. Smith, M. S., D. D. S., director.
Industrial Hygiene, Bureau of.
J. William Crosson, B. A., M D., director.
Maternal and Child Hygiene, Division of:
Thos. W. Nale, M D., B. S, director.
Public Health Education, Bureau of:
Dorothea Campbell, director.
Public Health Nursing, Bureau of:
Laurene C. Fisher, R N, director.
Sanitary Engineering, Division of
J B. Harrington, B E, director.
State Hygienic Laboratory:
Katherine E Cox, B. A., director.
Tuberculosis, Bureau of.
W. E. McIlvain, M S., B. S., director.
Venereal Diseases, Bureau of:
Leon A. Dickerson, M. D., B. S., director.
Vital Statistics, Division of·
Franklin H. Reeder, M. B., director.
Publications.
Community Sanitation News Letter—biweekly.
Monthly News Letter.
The Sanitarian—bimonthly.
Biennial Report.

WISCONSIN STATE BOARD OF HEALTH

Madison

State Health Officer·
C. A. Harper, B. S., M. D.
Carl N. Neupert, M. D., assistant.
Communicable Diseases, Bureau of:
Harry M. Guilford, B. S., M. D., chief.
Community Sanitation:
Roderick F. Bott, B. S., supervisor.
Dental Education:
F. A Bull, D. D. S., M. P. H., supervisor.
Industrial Hygiene:
Paul A. Brehm, B. S., M. D., supervisor.
Maternal and Child Health:
Amy Louise Hunter, A. B., M. S., M. D., Dr. P. H., chief.
Nursing Education:
Leila I. Given, B. S., R. N., director.
Public Health Nursing, Division of:
Cornelia van Kooy, R. N., supervisor.
Sanitary Engineering and Stream Pollution:
L. F. Warrick, B. S., M. S., State sanitary engineer.
Venereal Disease Control Officer:
Milton Trautmann, B. S., M. D., M. P. H.
Vital Statistics:
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WYOMING STATE DEPARTMENT OF HEALTH

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THE INFLUENCE OF DIETARY PROTEIN ON THE TOXICITY OF SULFANILAMIDE [1]

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The therapeutic application of sulfanilamide is not infrequently attended by untoward toxic manifestations involving the hematopoietic organs, the liver, the integument, the gastrointestinal tract and other structures. These have been described in the literature in considerable detail (*1*, *2*) although their immediate causes are not understood.

In previous work (*3*) it was shown that the chronic toxicity of ingested selenium was greatly influenced by dietary protein. Impairment of growth, serous effusions, liver cirrhosis, and anemia which regularly followed the continued ingestion of selenium at a suitable level in a low protein diet could be greatly mitigated or completely prevented by the inclusion of liberal protein. It became of interest to inquire whether a similar relationship might not exist with reference to subacute or chronic intoxication with sulfanilamide.

EXPERIMENTAL

All the work was done with albino rats of inbred stock. Young animals about 30 to 40 days old were used. The animals on the low protein and deficient diet in group A weighed 70 to 80 grams, those of group B weighed, on an average, about 60 grams, while those of groups C and D weighed about 50 grams each. About equal numbers of males and females were used in each group.

The experimental diets were as follows:

Group A: Casein 4 percent, corn starch 77 percent.

Group B: Casein 4 percent, starch 77 percent, l-cystine 0.1 percent.

Group C: Casein 4 percent, starch 76 percent, l-cystine 0.1 percent, dl-methionine 0.5 percent.

Group D: Casein 27 percent, starch 54 percent.

In addition to the above, the diets of all the groups contained dried brewers' yeast 5 percent, McCollum's salt mixture No. 185 4 per-

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[1] From the Divisions of Pharmacology and Pathology, National Institute of Health.

cent, cod liver oil 2 percent, and olive oil 8 percent. Since the brewers' yeast yielded 3 percent protein (N X 6.25) the total protein content of the first three groups was 7 percent, while that of group D was 30 percent. The cystine and methionine supplements in the diets of groups B and C were considered sufficient to supply the needs of the growing rat with respect to these two essential amino acids, and as previously shown a diet such as that of group C was adequate for normal growth over a period of at least 3 months, despite its low protein content (*3*).

After the animals had been on the respective diets for a period of 25 days sulfanilamide was administered intragastrically in doses of 1 gram per kilogram as a 5 percent suspension in 5 percent aqueous solution of gum acacia. The drug was given daily except Sundays and holidays until death or until the animals had received from 22 to 27 doses, when the experiment was discontinued and the animals were killed for post-mortem examination and histological study of the tissues. Blood studies, including hemoglobin determination, reticulocyte counts, and the examination of fixed and stained smears, were made at intervals during the course of the experiment. In addition the sulfanilamide concentration of the blood was studied in several members of each group at 2 hours, 28 hours, and 52 hours, respectively, following the last dose in order to ascertain differences, if any, in the degree of retention of the drug in the respective groups.

RESULTS

Of 15 animals in group A 5, or 33 percent, died in the course of sulfanilamide administration after receiving from 5 to 14 doses, the remaining 10 having survived 22 to 24 doses. Death usually occurred in these animals within a few hours after the last dose, and was preceded by progressive depression of the nervous system, muscular weakness, cyanosis, and dyspnea. Examination for methemoglobin in a few instances failed to reveal it. Seven of the animals, or 46 percent, had varying degrees of anemia characterized by anisocytosis, macrocytosis, polychromatophilia, Howell-Jolly bodies and normoblasts, with hemoglobin levels ranging from 7.1 to 11.0 grams and reticulocytes from 7 to 10 percent. In control animals, it should be added, this or the other diets used did not induce anemia in a period of 3 months.

In group B there were 11 animals, 5 of which died during treatment after receiving from 5 to 14 doses, and 6 of the animals, or 54 percent, developed anemia.

In groups C and D, in which there were 10 animals each, only 1 died in each group after receiving 7 and 12 doses, respectively. Five, or 50 percent, of the animals in group C had anemia, and none in

group D showed any evidence of blood dyscrasia. The hemoglobin levels in this last group ranged from 13 to 15.7 grams.

TABLE 1.—*Experimental data*

Group	Animals	Average weight change per animal	Mortality	Anemia	Average free blood sulfanilamide, hours after last dose	
					28	52
		Grams	*Percent*	*Percent*	*Mg. percent*	*Mg. percent*
A	15	+3	33	46	2.5	1.1
B	11	−2	45	54	4.3	1.2
C	10	+25	10	50	1.7	----------
D	10	+31	10	0	1.9	1.1

Weight changes during the course of sulfanilamide treatment were variable in groups A and B. Some of the animals gained in weight up to about 30 grams, others lost as much. On the average there were no significant changes from the original as shown in table 1. The animals in groups C and D made good gains throughout. The average increment in weight for this period was 25 grams per animal in group C and 31 grams in group D.

The concentration of free sulfanilamide in the blood, taken in several instances at 28 and 52 hours, respectively, after the last dose, showed no significant differences in the several groups at 52 hours but somewhat higher average values in the low protein groups A and B than in groups C or D at 28 hours. There was considerable variation, however, within the groups. The range for 8 animals in group A was 0.2 to 5.0, for 4 animals in group B, 0.3 to 13, for 5 animals in group C, 0.5 to 5.0, and for 3 animals in group D, 1.2 to 2.5 milligrams percent. Similar analyses made for total blood sulfanilamide at 28 hours in several animals in groups C and D showed higher values in the low protein group. The average for 9 animals in group C was 6.1, with a variation of from 1.5 to 14.0 milligrams percent, while the average for 4 animals in group D was 2.6, with a variation of from 0.5 to 4.0 milligrams percent. This appears to suggest a somewhat greater retention of the drug in the low protein groups.[2]

Histologic examination of the tissues revealed little of significance. More or less extensive accumulation of fine to medium fat droplets predominantly in the liver cells in the midzonal area of the lobule was observed in 63 to 85 percent of the animals in groups A and B, in 30 percent in group C, while the livers of the animals in group D were uniformly normal. However, similar fatty changes were found in several control animals on low protein diets and it is doubtful whether sulfanilamide played any part.

[2] We are indebted to Dr. S. M. Rosenthal of this laboratory for the blood sulfanilamide determinations.

In the kidney slight focal interstitial nephritis was observed in 12 of 38 sulfanilamide-treated animals examined with no special predilection for any one group. The lesion was characterized by interstitial lymphocyte infiltration, slight fibroblast proliferation, and slight fibrosis with focal tubular dilatation and atrophy. None of 12 control animals on low protein diets alone showed such lesions. An observation of considerable interest made in the course of examination of the kidneys was the occurrence of concentrically laminated calcareous concretions within the proximal convoluted tubules or replacing them. These were fat-free and often showed a slight incrustation giving a positive ferric iron test with acid ferrocyanide. Unlike the radially striated concretions described in rabbits by Nelson (*4*) these are not doubly refractile. These concretions were found in 27 percent and 57 percent of the animals of groups A and B, respectively, but in none of groups C and D. Examination of control animals revealed a somewhat similar incidence of renal concretions on the low protein diet whether or not supplemented with cystine but none on the low protein diet supplemented with cystine and methionine. The concretions appear to be the result of dietary deficiency, the exact nature of which remains to be determined.

The adrenals were consistently normal, with the exception of one instance in group D in which there was hemorrhagic disruption and necrosis of the medulla and inner half of the cortex.

The spleens of the sulfanilamide-treated animals, irrespective of group, showed some hyperplasia of the follicles, while the perifollicular zones were often relatively anemic with increased proliferation of reticulo-endothelial cells. The spleen pulp was usually congested. There was generally a moderate hemosiderosis, more marked in the perifollicular zones. The pulp usually showed more or less peritrabecular infiltration, in some animals by small lymphocytes, in some by large lymphoid, and in others by myeloid cells. When peritrabecular infiltration was more marked and more myeloid there were often also considerable numbers of normoblasts in the adjacent pulp forming erythroblastic islets. This myeloerythropoietic reaction was least in group A, greater in groups B and C, and most marked in group D. It would appear that sulfanilamide induces a splenic hemosiderosis and a splenic myeloerythropoietic reaction and that the animals on the unsupplemented low protein diet have the least capacity to react, those on the high protein diet the most. In rabbits Nelson (*4*) noted a similar hemosiderosis, but there was no myelopoietic reaction.

COMMENT

These experiments indicate that the toxicity of sulfanilamide is influenced by dietary protein. The greater mortality among the animals on the 7 percent protein diet as compared with those on 30

percent indicates a lowered resistance of the central nervous system which is apparently corrected by methionine and cystine but not by cystine alone. The high incidence of anemia in all the groups on the low protein diet, whether or not supplemented by cystine and methionine, and its complete absence in the group receiving 30 percent protein clearly indicates the value of liberal protein in preventing excessive blood destruction in prolonged treatment with sulfanilamide. Machella and Higgins (*5*) reported a moderate degree of anemia from 1 gram per kilogram of sulfanilamide given daily to rats but no mention is made of the composition of the diet. Whether or not this type of experimental anemia has any bearing on the acute hemolytic anemia reported clinically is not certain, though Watson and Spink (*6*) regard it as a more marked degree of the usual toxic effect of the drug on the hematopoietic system.

Increased susceptibility of other tissues to intensive sulfanilamide treatment under dietary conditions of low protein intake could not be demonstrated histologically. The occurrence of renal concretions and abnormal fat accumulation in the liver in many of our experimental animals is apparently not related to sulfanilamide but rather to the low protein diet per se. This is in agreement with the results recently reported by Tisenhausen and Charkes (*7*) who found parenchymal degeneration and granular disintegration of renal epithelium with urinary casts, and increased fat deposition in the livers of rats on prolonged protein starvation. Our observation of a protective action of methionine against the renal concretions suggests possibilities for further study.

The somewhat higher concentration of blood sulfanilamide in the animals on the low protein diets when taken about 24 hours after the last dose suggests greater retention and this may possibly account for the greater toxicity. This also raises the interesting question as to whether this might not be more than offset by the obvious advantages of higher concentrations of blood sulfanilamide in the therapeutic application of the drug.

CONCLUSIONS

A low protein diet (7 percent) increased the susceptibility of rats to orally administered sulfanilamide by increasing the mortality rate and the incidence of anemia as compared with similarly treated rats on a diet containing 30 percent protein. Supplementing the low protein diet with cystine to the level contained in the 30 percent protein diet had no effect, while a similar supplement of cystine plus methionine decreased the mortality rate but not the incidence of anemia. Examination of the blood sulfanilamide levels suggests the possibility of greater retention of the drug in animals on the low protein diet.

Histologic examination of the tissues failed to reveal specific damage attributable to low protein sulfanilamide treatment. Renal concretions and fatty metamorphosis of the liver were observed in animals on low protein diet irrespective of sulfanilamide treatment. The former appears to be preventable by methionine but not the latter.

A slight focal interstitial nephritis was present in about a third of the sulfanilamide-treated animals irrespective of diet.

Splenic pigmentation and myelosis were most pronounced in the sulfanilamide-treated animals on the high protein diet suggesting increased activity of hematopoietic organs to compensate for the blood destruction.

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DR. HERALD R. COX GIVEN THE 1940 THEOBALD SMITH AWARD

Dr. Herald R. Cox, principal bacteriologist of the United States Public Health Service, stationed at the Public Health Service Rocky Mountain Laboratory, Hamilton, Mont., has been unanimously nominated by the Theobald Smith Award Committee to receive the 1940 Theobald Smith award in medical science. This honor has been conferred on Doctor Cox for his outstanding research in the rickettsial diseases, resulting in the development of a new technique for the preparation of protective vaccines against Rocky Mountain spotted fever and typhus fever. The presentation was made at the meeting of the American Association for the Advancement of Science held in Philadelphia during December 1940 and January 1941.

Doctor Cox was appointed associate bacteriologist in the Public Health Service in 1936 and was promoted to principal bacteriologist in 1940. Before coming to the Public Health Service he served as instructor in immunology at Johns Hopkins University and as assist-

ant in bacteriology and pathology at the Rockefeller Institute for Medical Research, New York City. He is 33 years of age and a native of Indiana. He received his bachelor's degree at the Indiana State College and his doctorate at Johns Hopkins.

The Theobald Smith Award was established in 1935 by Eli Lilly & Co., to be bestowed upon an investigator under 35 years of age for "demonstrated research in the field of the medical sciences, taking into consideration independence of thought and originality." The award consists of a bronze medal and a pecuniary consideration of $1,000.

COURT DECISION ON PUBLIC HEALTH

Furnishing of respirators to employees engaged in certain work.—(St. Louis, Mo., Court of Appeals; *Blittschau* v. *American Car & Foundry Co.*, 144 S.W.2d 196; decided November 8, 1940.) A Missouri statute required that "in all processes of manufacture or labor referred to in this section which are productive of noxious or poisonous dusts, adequate and approved respirators shall be furnished and maintained by the employer in good condition and without cost to the employees." As this section had been expressly construed by the Supreme Court of Missouri it mandatorily required that adequate and approved respirators be furnished and maintained by an employer and, in so providing, left no room for discretion on the part of an employer in the manner of complying with the statute. In an action where recovery of damages for an occupational disease was sought and where one of the plaintiff's grounds of negligence was the defendant company's failure to have furnished him with an adequate and approved respirator as required by the statute, the court of appeals held that, inasmuch as the statute was imperative in its requirements and made no exception to its application in cases, such as the instant one, where there was evidence that the work or process carried on was productive of noxious or poisonous dusts, it was no part of the plaintiff's duty to offer evidence that respirators were practicable, feasible, or possible, or that the employer had the same at hand, or could have procured them at reasonable expense. Instead, it was said, the plaintiff's burden was limited merely to the introduction of evidence that the employer had violated the statute, resulting in the injury of which he complained.

DEATHS DURING WEEK ENDED DECEMBER 21, 1940

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 21, 1940	Corresponding week, 1939
Data from 88 large cities of the United States:		
Total deaths	8,697	8,504
Average for 3 prior years	8,583	
Total deaths, 51 weeks of year	427,313	420,518
Deaths under 1 year of age	518	461
Average for 3 prior years	487	
Deaths under 1 year of age, 51 weeks of year	25,746	25,249
Data from industrial insurance companies:		
Policies in force	64,781,253	66,416,008
Number of death claims	11,617	12,546
Death claims per 1,000 policies in force, annual rate	9.4	9.8
Death claims per 1,000 policies, 51 weeks of year, annual rate	9.6	9.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 28, 1940

Summary

For the current week a total of 45,475 cases of influenza was reported by the State health officers, as compared with 42,457 cases for the preceding week.[1] The largest decreases are shown in the three Pacific Coast States, the total for which dropped from 18,522 cases to 10,689. The incidence also declined in the East North Central area, from 1,058 cases to 358, a decrease accounted for entirely by the decrease in Indiana. Little change is recorded for the Mountain States, a low prevalence continues in the New England and Middle Atlantic areas, while the most significant increases occurred in the West North Central, South Atlantic, and South Central States. Of the 1,848 cases reported in Oklahoma, about one-half are stated to be delayed reports for the preceding week. The number of cases in Texas increased from 1,236 to 7,307. A general increase in upper respiratory infection was reported in Pennsylvania, but it was stated that there was no evidence either of a localized or general influenza epidemic.

Available information indicates that the disease continues to be of mild type, with little or no increase in pneumonia deaths. Up to December 21, pneumonia mortality in a group of large cities, as reported to the Public Health Service, was below the 5-year average and for the weeks ended December 14 and 21, the total number of deaths reported to the Bureau of the Census by 88 major cities was slightly above the 3-year (1937–39) average but dropped below the average for the current week.

The incidence of the other 8 communicable diseases reported in the following weekly table remained favorable during the current week; and for 1940 only influenza and poliomyelitis were above the 5-year (1935–39) median expectancy.

For the current week the Bureau of the Census reports 8,939 deaths in 88 major cities of the United States, as compared with 8,697 for the preceding week and with a 3-year (1935–39) average of 9,307 for the corresponding week.

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[1] See correction of figures for week ended December 21 on p. 35.

Telegraphic morbidity reports from State health officers for the week ended December 28, 1940, and comparison with corresponding week of 1939 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1935-39	Week ended		Median 1935-39	Week ended		Median 1935-39	Week ended		Median 1935-39
	Dec. 28, 1940	Dec. 30, 1939		Dec. 28, 1940	Dec. 30, 1939		Dec. 28, 1940	Dec. 30, 1939		Dec. 28, 1940	Dec. 30, 1939	
NEW ENG.												
Maine	0	2	3	24	1	4	35	39	35	0	0	0
New Hampshire	0	0	0	------	------	------	0	12	12	0	0	0
Vermont	0	0	0	------	------	------	44	24	24	0	0	0
Massachusetts	1	2	4	------	------	------	223	191	180	1	0	1
Rhode Island	0	1	0	------	------	------	1	101	28	0	1	0
Connecticut	1	0	1	1	1	6	9	67	50	1	0	0
MID. ATL.												
New York	20	26	36	[1]32	[1]9	[1]17	1,098	319	319	1	0	8
New Jersey	9	15	16	6	16	16	405	24	27	0	0	1
Pennsylvania	13	37	31	------	------	------	966	60	60	1	10	4
E. NO. CEN.												
Ohio	10	25	47	55	45	11	224	25	25	2	4	4
Indiana	12	13	19	229	8	35	32	5	7	0	0	0
Illinois	33	45	45	24	15	29	731	17	22	0	2	3
Michigan [2]	5	6	17	6	------	1	795	172	100	0	1	1
Wisconsin	1	0	3	44	30	41	309	73	84	1	0	0
W. NO. CEN.												
Minnesota	0	1	1	------	2	------	3	67	32	0	0	1
Iowa	0	9	8	201	10	7	114	56	15	1	0	0
Missouri	1	2	19	16	1	50	11	2	3	1	0	2
North Dakota	2	1	2	43	24	------	16	3	1	1	0	0
South Dakota	2	2	2	------	4	1	1	4	2	0	0	0
Nebraska	0	0	2		------	------	10	2	3	0	0	0
Kansas	6	9	8	1,607	26	4	88	64	7	0	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	4	1	2	0	0	0
Maryland [2] [3]	2	9	8	7	19	14	9	3	39	2	0	2
Dist. of Col.	1	2	5	6	5	4	5	0	1	0	0	0
Virginia	82	30	34	558	195	------	180	12	38	1	0	2
West Virginia [2]	6	12	12	15	19	22	16	8	20	2	2	3
North Carolina	13	24	35	6	83	14	136	65	65	1	1	1
South Carolina [3]	5	10	6	440	2,261	311	53	6	6	0	0	0
Georgia [3]	10	11	11	636	673	86	25	7	0	0	1	1
Florida [3]	3	2	8	38	22	2	0	2	2	[4]0	0	2
E. SO. CEN.												
Kentucky	5	19	16	1,089	7	15	135	13	13	3	4	5
Tennessee	4	8	16	289	30	45	55	68	21	0	1	1
Alabama [3]	13	40	23	332	1,298	143	32	15	15	3	1	1
Mississippi [2] [3]	5	13	11	------	------	------	------	------	------	0	0	1
W. SO. CEN.												
Arkansas	7	15	15	4,260	94	91	304	0	3	0	0	0
Louisiana [3]	1	15	13	6,101	------	10	2	7	7	1	0	1
Oklahoma	14	14	14	1,848	126	114	4	4	4	0	0	3
Texas [2] [3] [4]	40	39	45	7,307	334	385	46	67	67	3	0	2
MOUNTAIN												
Montana	2	1	1	388	192	15	3	6	5	0	0	0
Idaho	0	0	0	18	1	5	2	88	25	0	0	0
Wyoming	0	0	0	548	115	------	1	2	1	0	0	0
Colorado	1	8	6	805	145	------	70	13	13	0	0	0
New Mexico	1	1	2	56	9	5	28	13	13	0	0	0
Arizona	2	2	2	1,735	102	90	80	9	2	0	0	0
Utah [2]	0	1	1	5,048	964	------	2	63	16	0	0	0
Nevada	------	------	------	968	------	------	------	------	------	------	------	------
PACIFIC												
Washington	6	2	3	1,686	2	------	17	316	139	0	1	0
Oregon	3	4	1	1,877	171	36	13	31	21	0	0	0
California [3]	10	19	40	7,126	38	38	38	191	191	2	1	2
Total	302	497	614	45,475	7,097	2,088	6,378	2,337	2,309	28	31	75
52 weeks [4]	15,715	24,086	28,779	309,669	189,352	157,823	276,032	374,854	374,854	1,609	1,962	5,390

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 28, 1940, and comparison with corresponding week of 1939 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1935–39	Week ended		Median 1935–39	Week ended		Median 1935–39	Week ended		Median 1935–39
	Dec. 28, 1940	Dec. 30, 1939		Dec. 28, 1940	Dec. 30, 1939		Dec. 28, 1940	Dec. 30, 1939		Dec. 28, 1940	Dec. 30, 1939	
NEW ENG.												
Maine	1	0	0	4	12	20	0	0	0	0	0	1
New Hampshire	0	0	0	2	3	10	0	0	0	0	0	0
Vermont	0	0	0	8	0	5	0	0	0	1	1	0
Massachusetts	0	2	0	144	119	153	0	0	0	0	2	2
Rhode Island	0	0	0	4	4	8	0	0	0	0	0	0
Connecticut	0	0	0	24	62	50	0	0	0	0	0	0
MID. ATL.												
New York	2	3	1	252	371	402	0	0	0	8	4	6
New Jersey	1	0	0	147	198	114	0	0	0	1	3	8
Pennsylvania	0	0	0	180	344	302	0	0	0	7	7	7
E. NO. CEN.												
Ohio	3	1	0	190	344	332	0	2	3	1	9	4
Indiana	3	0	0	125	117	134	2	0	5	2	0	1
Illinois	3	1	3	326	322	327	11	0	5	1	10	8
Michigan [3]	2	0	0	194	271	301	4	0	0	2	7	6
Wisconsin	5	0	0	124	157	192	13	10	7	0	2	1
W. NO. CEN.												
Minnesota	1	1	0	45	104	114	25	28	19	0	0	1
Iowa	2	3	0	70	160	141	1	22	12	1	0	0
Missouri	0	0	0	34	46	104	0	8	9	1	1	4
North Dakota	0	0	0	13	25	25	0	0	5	0	0	0
South Dakota	0	0	0	12	22	30	0	4	5	0	0	0
Nebraska	0	0	0	6	14	33	0	1	6	0	0	0
Kansas	1	1	0	65	71	148	0	0	6	0	1	1
SO. ATL.												
Delaware	0	0	0	3	7	8	0	0	0	0	0	0
Maryland [2,3]	0	0	0	35	61	56	0	0	0	4	3	4
Dist. of Col.	0	0	0	16	9	12	0	0	0	0	1	1
Virginia	1	0	0	62	35	39	0	0	0	4	6	5
West Virginia [3]	1	3	0	51	74	63	0	2	0	1	1	1
North Carolina	0	1	0	50	44	44	0	0	0	3	1	3
South Carolina [3]	0	0	0	10	4	8	0	0	0	0	0	0
Georgia [3]	0	0	0	29	22	20	0	0	0	2	6	5
Florida [3]	0	0	1	5	11	10	0	0	0	2	1	1
E. SO. CEN.												
Kentucky	0	1	1	53	58	58	0	0	0	4	0	2
Tennessee	0	0	0	75	22	36	0	0	0	5	2	2
Alabama [3]	2	0	1	20	47	15	0	0	0	6	1	6
Mississippi [2,3]	0	1	1	11	8	10	0	0	0	0	0	1
W. SO. CEN.												
Arkansas	0	0	1	8	17	17	0	9	5	0	5	5
Louisiana [3]	0	0	0	1	15	14	0	0	0	5	8	4
Oklahoma	1	1	0	15	23	36	1	8	3	1	4	4
Texas [2,3,4]	2	0	2	69	48	104	1	4	3	6	11	9
MOUNTAIN												
Montana	0	0	0	9	24	24	1	0	10	0	0	0
Idaho	0	0	0	8	13	21	1	0	3	0	0	0
Wyoming	1	0	0	0	6	10	0	0	0	0	0	0
Colorado	0	0	0	26	21	31	1	17	2	1	1	0
New Mexico	0	2	0	5	15	17	0	0	0	0	5	4
Arizona	0	0	0	7	8	8	0	1	0	2	0	0
Utah [2]	1	0	0	1	7	15	0	2	0	0	1	0
Nevada	------	------	------	------	------	------	------	------	------	------	------	------
PACIFIC												
Washington	0	3	0	24	48	52	0	4	4	1	0	0
Oregon	1	0	0	6	19	37	0	1	5	0	0	0
California [3]	2	3	4	71	120	171	------	8	8	8	2	8
Total	36	27	27	2,639	3,552	3,721	61	118	193	80	106	123
52 weeks [4]	9,769	7,288	7,288	155,064	162,052	223,425	2,462	9,574	9,574	9,585	12,736	14,220

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 28, 1940, and comparison with corresponding week of 1939 and 5-year median—Con.

Division and State	Whooping cough, Week ended Dec. 28, 1940	Whooping cough, Week ended Dec. 30, 1939	Division and State	Whooping cough, Week ended Dec. 28, 1940	Whooping cough, Week ended Dec. 30, 1939
NEW ENG.			SO. ATL.—continued		
Maine	23	48	Georgia [3]	16	2
New Hampshire	0	1	Florida [3]	1	2
Vermont	6	30	E. SO. CEN.		
Massachusetts	233	88	Kentucky	45	77
Rhode Island	5	6	Tennessee	24	11
Connecticut	35	44	Alabama [3]	21	24
MID. ATL.			Mississippi [2 3]		
New York	323	391	W. SO. CEN.		
New Jersey	85	116	Arkansas	15	2
Pennsylvania	373	306	Louisiana [3]	3	11
E. NO. CEN.			Oklahoma	12	0
Ohio	253	151	Texas [2 3 4]	160	79
Indiana	23	14	MOUNTAIN		
Illinois	120	106	Montana	3	5
Michigan [2]	292	104	Idaho	11	2
Wisconsin	110	117	Wyoming	1	14
W. NO. CEN.			Colorado	19	11
Minnesota	38	31	New Mexico	12	21
Iowa	61	22	Arizona	14	4
Missouri	7	3	Utah [2]	16	52
North Dakota	18	2	Nevada		
South Dakota	2	0	PACIFIC		
Nebraska	13	1	Washington	27	5
Kansas	53	8	Oregon	6	40
SO. ATL.			California [3]	128	97
Delaware	7	6	Total	2,967	2,202
Maryland [2 3]	65	46	52 weeks	[4] 170,911	172,569
Dist. of Col.	17	10			
Virginia	113	21			
West Virginia [2]	35	13			
North Carolina	79	44			
South Carolina [3]	39	19			

[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended December 28, 1940, 35 cases as follows: Maryland, 1; South Carolina, 5; Georgia, 13; Florida, 1; Alabama, 7, Mississippi, 1; Louisiana, 1; Texas, 5, California, 1.

[4] The figures for the week ended Dec. 21, printed in the Public Health Reports of Dec. 27, 1940, pp. 2401–2403, should be corrected as follows.—Texas Diphtheria, 36; influenza, 1,236; measles, 35; meningococcus meningitis, 1, poliomyelitis, 1, scarlet fever, 32, smallpox, 0; typhoid fever, 4, whooping cough, 142, typhus fever, 6. A later report also shows 1 case of meningococcus meningitis in Florida. Affected accordingly are the aggregate and cumulative figures given on the pages named.

WEEKLY REPORTS FROM CITIES

City reports for week ended December 14, 1940

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	177	202	56	929	460	1,212	15	340	28	999	--------
Current week[1]	67	5,455	51	2,375	414	926	21	306	12	1,415	--------
Maine:											
Portland	0	------	0	0	2	0	0	0	0	18	24
New Hampshire:											
Concord	0	------	0	0	0	1	0	0	0	0	10
Manchester	0	------	0	0	1	12	0	0	0	0	17
Nashua	0	------	0	0	0	0	0	0	0	0	7
Vermont:											
Barre	0	------	0	0	1	0	0	0	0	0	3
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	0	77	19	51	0	4	0	135	215
Fall River	3	------	0	0	6	9	0	1	0	7	21
Springfield	0	------	0	1	0	3	0	1	1	1	40
Worcester	0	------	0	103	7	10	0	1	0	0	65
Rhode Island:											
Pawtucket	0	------	0	0	3	0	0	0	0	1	20
Providence	0	------	0	1	3	5	0	4	0	1	63
Connecticut:											
Bridgeport	0	2	2	1	0	8	0	1	0	0	30
Hartford	0	------	0	1	2	0	0	0	0	8	42
New Haven	0	------	0	2	0	11	0	1	0	39	41
New York:											
Buffalo	0	------	1	30	7	34	0	6	0	16	139
New York	16	20	2	592	53	104	0	63	1	148	1,458
Rochester	0	1	0	0	2	4	0	0	0	21	61
Syracuse	0	------	0	0	4	0	0	1	0	6	51
New Jersey:											
Camden	0	------	0	43	4	8	0	1	0	1	30
Newark	0	2	0	50	7	38	0	12	0	16	82
Trenton	0	------	0	2	4	12	0	2	1	4	43
Pennsylvania:											
Philadelphia	1	6	4	338	34	84	0	27	0	107	536
Pittsburgh	1	1	2	1	11	20	0	6	0	57	146
Reading	0	------	0	35	3	0	0	2	0	6	33
Scranton	0	------	0	0	0	0	0	0	0	1	1
Ohio:											
Cincinnati	1	------	0	8	3	17	0	4	0	7	115
Cleveland	1	15	0	42	14	9	0	11	0	100	198
Columbus	0	1	1	2	4	6	0	2	0	18	93
Toledo	1	1	0	1	6	9	0	3	0	15	87
Indiana:											
Anderson	1	------	0	0	0	4	0	0	0	0	9
Fort Wayne	0	------	0	0	2	2	0	0	0	0	29
Indianapolis	2	------	7	3	10	20	0	3	0	3	112
Muncie	1	------	0	0	2	7	0	0	1	0	16
South Bend	0	------	0	0	1	0	0	0	0	0	17
Terre Haute	0	------	1	0	3	0	0	0	0	0	22
Illinois:											
Alton	0	------	0	0	2	6	0	0	0	3	9
Chicago	9	5	5	491	27	163	0	29	0	88	686
Elgin	0	------	0	0	1	0	0	0	0	0	12
Springfield	0	------	0	0	2	15	0	0	0	10	19
Michigan:											
Detroit	4	1	0	391	10	66	8	11	0	146	257
Flint	0	------	0	10	5	5	0	0	0	13	22
Grand Rapids	0	------	0	5	0	1	0	1	0	17	28
Wisconsin:											
Kenosha	0	------	0	0	0	2	0	0	0	1	8
Madison	0	------	0	2	0	3	0	0	0	3	23
Milwaukee	0	1	0	21	3	27	0	3	0	20	100
Racine	0	------	0	1	0	2	0	0	0	0	10
Superior	0	------	0	2	0	3	1	0	0	8	11
Minnesota:											
Duluth	0	------	0	1	2	4	10	0	0	8	25
Minneapolis	0	------	3	2	2	17	1	2	0	37	102
St. Paul	0	------	0	2	5	18	0	2	0	24	78

[1] Figures for Boise estimated; report not received.

City reports for week ended December 14, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0			0		9	0		0	0	
Davenport	0			1		6	0		0	0	
Des Moines	0		0	1	0	8	0	0	0	0	31
Sioux City	0			1		2	0		0	2	
Waterloo	0			0		10	0		0	3	
Missouri:											
Kansas City	0			0	9	9	0	4	0	56	99
St. Joseph	0		0	0	10	0	0	0	0	0	25
St. Louis	4		0	0	15	20	0	5	2	12	225
North Dakota:											
Fargo	0			0		0	0		0	2	
Minot	0		0	0	0	0	0	0	0	0	11
South Dakota:											
Aberdeen	0			1		0	0		0	2	
Sioux Falls	0		0	0	0	5	0	0	0	0	7
Nebraska:											
Lincoln	0			2		5	0		0	5	
Omaha	0		1	0	1	14	0	0	0	5	53
Kansas:											
Lawrence	0	1	0	12	0	0	0	0	0	0	3
Topeka	0		0	0	2	2	1	1	0	4	14
Wichita	1	2	0	1	1	2	0	0	0	13	24
Delaware:											
Wilmington	0		0	1	1	0	0	1	0	11	27
Maryland:											
Baltimore	1	3	1	2	8	20	0	6	0	47	204
Cumberland	0		0	0	0	0	0	0	0	0	7
Frederick	0		0	0	0	0	0	0	0	0	1
Dist. of Col.:											
Washington	0	2	2	0	12	9	0	13	0	10	200
Virginia:											
Lynchburg	2		0	0	3	1	0	0	0	0	14
Norfolk	2	24	0	3	5	0	0	0	0	4	32
Richmond	0		1	0	4	4	0	0	2	0	52
Roanoke	0		0	24	1	0	0	0	0	18	21
West Virginia:											
Charleston	0	1	1	0	0	2	0	2	0	0	7
Huntington	0			1		1	0		0	0	
Wheeling	0		0	0	3	1	0	0	0	7	17
North Carolina:											
Gastonia	0			0		0	0		0	5	
Raleigh	0		0	0	0	3	0	0	1	3	10
Wilmington	0		0	0	0	0	0	0	1	0	11
Winston-Salem	0		0	0	0	3	0	1	0	26	16
South Carolina:											
Charleston	0	46	0	3	5	1	0	1	0	0	21
Florence	0	3	0	0	1	0	0	1	0	0	22
Greenville	0		0	3	1	0	0	0	0	0	20
Georgia:											
Atlanta	0	5	0	0	7	8	0	6	0	0	80
Brunswick	0		0	0	0	0	0	0	0	2	5
Savannah	0	4	0	1	1	1	0	1	0	0	20
Florida:											
Miami	0	4	0	1	1	0	0	1	2	0	38
Tampa	0		0	0	1	0	0	0	0	0	28
Kentucky:											
Ashland	0	4	0	0	2	0	0	1	0	0	8
Covington	0		0	3	2	2	0	2	0	0	19
Lexington	0		0	72	2	0	0	1	0	13	15
Tennessee:											
Knoxville	1	1	0	1	0	2	0	1	0	9	23
Memphis	0	4	0	9	1	10	0	3	0	6	88
Nashville	0		0	1	3	4	0	2	0	0	48
Alabama:											
Birmingham	3	3	0	13	3	4	0	3	0	9	54
Mobile	2		0	0	2	0	0	0	0	0	29
Montgomery	0			0		1	0		1	0	
Arkansas:											
Fort Smith	1	1		0		2	0		0	0	
Little Rock	0	14	0	0	2	0	0	1	0	0	20
Louisiana:											
Lake Charles	3		0	0	0	1	0	1	0	0	5
New Orleans	3	129	5	0	10	2	0	12	3	4	27
Shreveport	0		0	0	5	3	0	3	0	0	48
Oklahoma:											
Oklahoma City	1	37	0	0	3	3	0	0	0	0	38
Tulsa	2		0	0	4	4	0	0	0	2	26

City reports for week ended December 14, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet-fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Texas:											
Dallas	1	1	1	0	0	0	0	1	0	0	67
Fort Worth	0	------	0	3	2	4	0	2	0	4	45
Galveston	0	------	0	0	0	0	0	1	0	0	14
Houston	3	3	0	0	6	4	0	4	0	3	77
San Antonio	1	183	0	0	1	0	0	3	0	5	48
Montana:											
Billings	0	------	0	0	1	0	0	0	0	0	12
Great Falls	1	------	0	1	0	5	0	0	0	0	6
Helena	0	------	0	2	0	1	0	0	0	0	4
Missoula	0	------	0	0	1	0	0	0	0	0	8
Idaho:											
Boise	------	------	------	------	------	------	------	------	------	------	------
Colorado:											
Colorado Springs	0	------	0	1	0	0	0	0	0	3	7
Denver	4	------	0	44	6	4	0	2	0	8	86
Pueblo	0	------	0	1	2	2	0	0	0	3	15
New Mexico:											
Albuquerque	0	------	0	1	1	0	0	0	0	0	9
Utah:											
Salt Lake City	2	------	0	0	2	4	0	0	0	3	47
Washington:											
Seattle	0	------	1	3	4	1	0	2	0	5	88
Spokane	0	74	0	1	5	3	0	2	0	0	30
Tacoma	0	------	0	1	0	1	0	1	0	8	36
Oregon:											
Portland	1	215	1	0	5	6	0	0	0	0	78
Salem	0	13	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	1	4,223	8	7	12	16	0	19	0	36	384
Sacramento	0	120	1	0	6	2	0	2	0	1	45
San Francisco	0	583	1	2	10	3	0	9	0	34	216

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Michigan:			
Worcester	6	1	0	Detroit	2	1	0
New York:				Wisconsin:			
Buffalo	2	0	0	Racine	0	0	1
New York	2	0	0	Minnesota:			
Pennsylvania:				Minneapolis	0	0	1
Scranton	1	1	0	Missouri:			
Ohio:				St. Joseph	0	1	0
Cincinnati	1	0	0	South Carolina:			
Cleveland	1	0	0	Florence	0	1	0
Toledo	0	0	1	Louisiana:			
Indiana:				Shreveport	0	1	0
Indianapolis	0	1	1	California:			
Illinois:				Los Angeles	0	0	1
Chicago	1	0	2				
Springfield	0	0	1				

Encephalitis, epidemic or lethargic.—Cases: New York, 2; Muncie, 1; St. Louis, 1; Washington, 1.
Pellagra.—Cases: Charleston, S. C., 1; Savannah, 1; Montgomery, 1; Dallas, 1.
Typhus fever.—Cases: Charleston, S. C., 1; Atlanta, 2; Savannah, 4; New Orleans, 1; Houston, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague.—A rat found on November 29, 1940, in Paauilo, Hamakua District, Island of Hawaii, has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended November 30, 1940.—During the week ended November 30, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Bruns-wick	Que-bec	On-tario	Mani-toba	Sas-katch-ewan	Alber-ta	British Colum-bia	Total
Cerebrospinal meningitis				1	6				1	8
Chickenpox				281	415	55	101	114	139	1,105
Diphtheria		28		23	2	5	3			61
Dysentery					1				2	3
Influenza		24			12	1			492	529
Measles	26	90		63	349	126	158	58	111	981
Mumps				3	144	24	1	10	20	202
Pneumonia	4				9	1			15	29
Poliomyelitis					3					3
Scarlet fever	2	5	7	143	140	6	15	12	31	361
Trachoma									9	9
Tuberculosis	1	6	7	52	50	1	18			135
Typhoid and paratyphoid fever			1	16	3		2	2	1	25
Whooping cough		10		232	157	31	11	13	8	462

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Public Health Reports

VOLUME 56 JANUARY 10, 1941 NUMBER 2

IN THIS ISSUE

Summary of Defects Among Men Drafted in the World War

New Pneumococcus Crossing With Five Recognized Strains

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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CONTENTS

Public Health Reports

Vol. 56 • JANUARY 10, 1941 • *No. 2*

SUMMARY OF PHYSICAL FINDINGS ON MEN DRAFTED IN THE WORLD WAR

By ROLLO H. BRITTEN, *Senior Statistician*, and GEORGE ST. J. PERROTT, *Chief, Division of Public Health Methods, National Institute of Health, United States Public Health Service*

In connection with a suggested program of physical rehabilitation of registrants disqualified for duty with the armed forces under the Selective Training and Service Act of 1940,[1] it is desirable to summarize in available form the major findings of the World War draft examinations of 1917–18.[2] On the basis of estimates of the number of men to be conscripted in the draft of 1940–41,[3] the World War draft findings afford some indication of the numbers of men who, because of physical and mental impairments, will be classified as not available for general military training in the various States between now and July 1, 1941, and also the impairments which will be recorded among them.

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[1] See Public Health in the National Defense Program. Summary of Proceedings, Special Conference of State and Territorial Health Officers with the United States Public Health Service, Washington, D. C., September 16–17, 1940. Pub. Health Rep., 55: 1760–1776 (1940).

[2] Love, Albert G., and Davenport, Charles B.: Defects Found in Drafted Men. Statistical information compiled from the draft records, showing the physical conditions of the men registered and examined in pursuance of the requirements of the Selective Service Act. Government Printing Office, Washington, 1920.

[3] Preliminary quotas by States announced by the Selective Service headquarters (October 19, 1940) are as follows:

First Corps Area	37,961
Connecticut	8,421
Maine	3,081
Massachusetts	20,556
New Hampshire	1,579
Rhode Island	3,118
Vermont	1,206
Second Corps Area	148,295
Delaware	1,329
New Jersey	32,170
New York	114,796
Third Corps Area	87,815
District of Columbia	3,982
Maryland	12,564
Pennsylvania	61,522
Virginia	9,747
Fourth Corps Area	100,515
Alabama	13,711
Florida	10,370
Georgia	12,792
Fourth Corps Area—Con.	
Louisiana	15,084
Mississippi	12,759
North Carolina	15,613
South Carolina	5,957
Tennessee	14,229
Fifth Corps Area	91,192
Indiana	21,087
Kentucky	9,154
Ohio	52,497
West Virginia	8,454
Sixth Corps Area	131,137
Illinois	62,223
Michigan	47,282
Wisconsin	21,632
Seventh Corps Area	84,625
Arkansas	8,846
Iowa	11,738
Kansas	8,388
Minnesota	18,652
Missouri	23,619
Nebraska	6,456
Seventh Corps Area—Con.	
North Dakota	3,401
South Dakota	3,525
Eighth Corps Area	52,475
Arizona	3,098
Colorado	3,837
New Mexico	2,962
Oklahoma	9,365
Texas	33,213
Ninth Corps Area	54,985
California	38,017
Idaho	1,954
Montana	2,563
Nevada	624
Oregon	2,806
Utah	2,153
Washington	5,821
Wyoming*	1,047
Hawaii	1,400
Puerto Rico	9,600
Total	800,000

*Wyoming was subsequently changed from the Ninth to the Seventh Corps Area.

In order that the data given may be as valuable as possible from this point of view, the present summary has been confined to a group of drafted men (the so-called "second million") who were examined at camp after May 1, 1918. By this time, examination procedures had become more efficient and standardized, and, it is believed, more nearly comparable to those which will be given under the present law.[4] It is necessary, of course, to consider the local board examinations also, since men rejected (and a large proportion of those placed in limited service groups) by local boards were not sent to camp and were therefore not included in the camp records.[5] Local board data are, in general, limited to the reexaminations made under an order promulgated by the President on November 8, 1917.

On this basis 21.3 percent of drafted men[6] were rejected, 9.9 percent were placed in limited service groups, and 52.1 percent were found to have defects. Thus, about one-third (31.2 percent) were classified as not available for general military service. If one felt justified in applying this latter percentage to examinations to be made under the Selective Training and Service Act of 1940, he would conclude that about 1,200,000 men would have to be examined to meet the quota of 800,000 (expected by July 1, 1941) and thus that about 400,000 would be rejected or placed in the limited service group, i. e., would be classified, on physical grounds, as not available for general military service.[7]

On the basis of World War draft data to be given later in this paper estimates may be made of the number of defects which will be noted among these 400,000 men. Such estimates are presented (to the nearest hundred) in table 1. It is to be observed that a single individual might have been recorded as having more than one impairment, which explains the fact that the number of impairments is 497,100 and not 400,000. Figures 1 and 2 present the comparison graphically, first by broad groups of defects, second by more specific defects. In the charts, rates (taken from table 4) are substituted for the actual numbers, since they are more generally applicable. It would be desirable, but is not practicable, to give the proportion of persons according to the defect which caused them to be judged unfit for general military service; however, rates are calculated per 1,000 total drafted men rather than per 1,000 men not available for general military service, in order to come as close as possible to this concept.

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[4] An additional point is that the punched cards for the so-called "first million" recorded only one defect on any one individual, whereas the cards for local board examinations and for the "second million" recorded more than one (if reported).

[5] See appendix for method of calculation. Rates given on pp. 1703-1704 of the article cited in footnote 1 differ from those appearing in this report by reason of differences in the method of calculation. In the former article, for instance, persons placed in limited service groups by local boards (and who did not get to camp) were disregarded.

[6] The term "drafted men," as used in this report, refers to examined persons, thus including those rejected.

[7] Number to be examined equals quota (800,000) divided by 1 minus the proportion classified as not available for general military service (taken as one-third because of lack of precision in the estimate).

TABLE 1.—*Estimated number of defects that will be found among 400,000 men not available for general military service because of physical or mental impairments (out of a total of 1,200,000 men examined)*

Diseases or defects	Number	
Orthopedic impairments	126,400	
Crippled or paralyzed members		46,400
Lost members:		
Upper extremities:		
Fingers		6,300
Other		1,800
Lower extremities		4,700
Flat feet		38,900
Other specified foot defects		20,800
Curvature of the spine		7,500
Eye defects	64,200	
Defective vision		49,000
Blindness in one or both eyes		8,800
Trachoma		1,300
Other eye defects		5,100
Cardiovascular-renal diseases	56,700	
Valvular diseases of the heart		33,400
Cardiac hypertrophy		4,600
Tachycardia		5,800
Functional heart diseases		4,100
Other		8,800
Underweight	35,600	
Hernia and inguinal rings	31,000	
Hernia		25,200
Enlarged rings		5,800

Diseases or defects	Number	
Tuberculosis (all forms) actual or suspected	29,100	
Defective and deficient teeth	29,000	
Nervous or mental diseases	28,600	
Mental deficiency		14,400
Epilepsy		4,700
Mental alienation		4,400
Other		5,100
Ear defects	17,500	
Defective hearing		8,200
Otitis media		8,200
Other ear diseases		1,100
Venereal diseases	8,500	
Gonorrhea		5,000
Syphilis		3,300
Chancroid		200
Varicose veins, varicocele	7,400	
Goiter	6,800	
Hypertrophic tonsillitis	6,300	
Arthritis and allied affections	3,800	
Asthma	2,700	
Other diseases or defects	43,500	
All diseases or defects	497,100	

It will be observed that many of the diagnosis groups represent defects of which a large proportion may be regarded as remediable. From this point of view, perhaps the most important conditions are: Defective vision (40.8 per 1,000 total drafted men), underweight

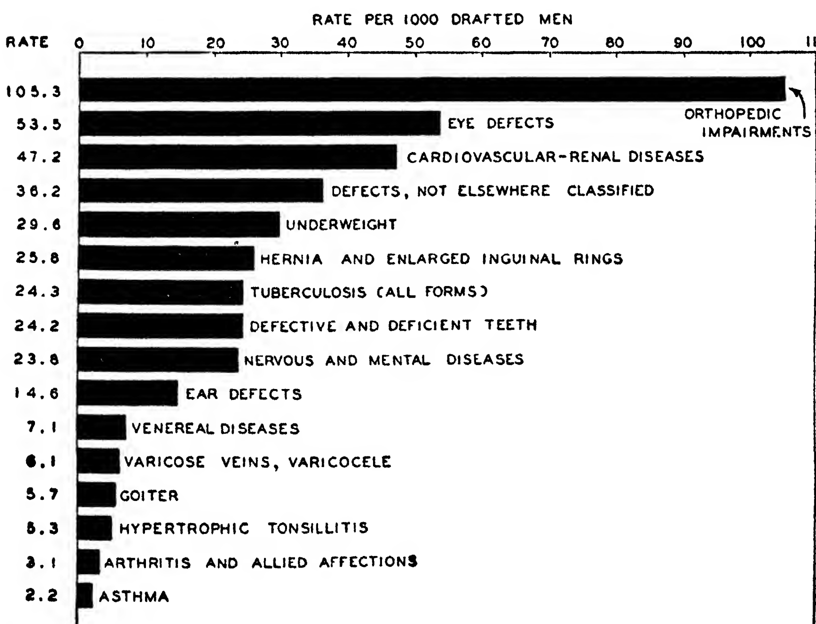

FIGURE 1.—Prevalence of defects (per 1,000 drafted men) noted in men who were rejected or accepted for limited service only (broad groups).

(29.6), tuberculosis (24.3), defective and deficient teeth (24.2), hernia (21.0), venereal diseases (7.1),[8] defective hearing (6.8), otitis media (6.8), varicose veins and varicocele (6.1), goiter (5.7), hypertrophic tonsillitis (5.3), and trachoma (1.1). Many of the individual cases classified under various other diagnosis groups would also prove to be correctible.

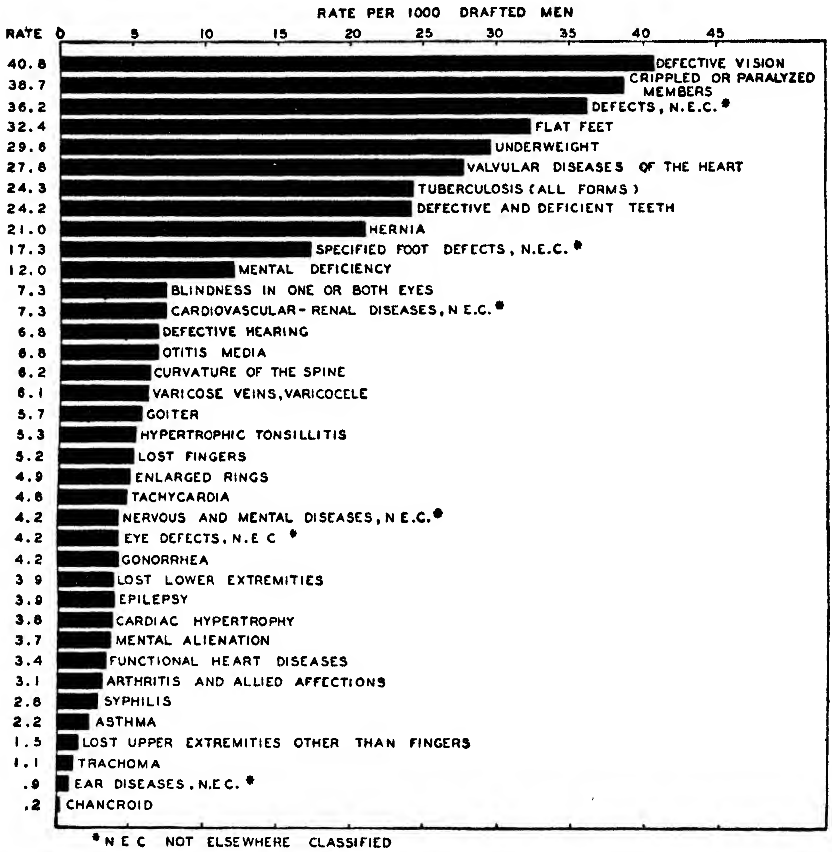

FIGURE 2.—Prevalence of defects (per 1,000 drafted men) noted in men who were rejected or accepted for limited service only (specific diagnoses).

The possible distribution, by States, of the estimated 400,000 men not available for general military training is, of course, of great interest as indicating the extent of the problem of rehabilitation in each State. Any such figures are subject to grave errors, since the number who will volunteer in each State is not known, and since it is not certain to what extent the wide State-to-State variation of the World War draft data will be repeated in the present examinations, but there seems no basis upon which any estimates can be made other

[8] In view of modern serodiagnostic methods and the adoption of plans for Wassermann tests on all persons examined, the number of men diagnosed as having venereal disease may be expected to be increased considerably.

than the experience of the World War draft. Hence, in spite of a possible early refutation of the estimates, they are presented here as the only available estimates of the magnitude of the proposed rehabilitation project in each State. The numbers are given in table 2 and the percentages in figure 3.

TABLE 2.—*Estimated distribution by State of 400,000 persons not available for general military service* [1]

State	Estimated number	State	Estimated number
Alabama	4, 600	Nevada	200
Arizona	900	New Hampshire	1, 000
Arkansas	2, 600	New Jersey	17, 200
California	22, 100	New Mexico	1, 100
Colorado	2, 300	New York	78, 500
Connecticut	4, 800	North Carolina	6, 900
Delaware	800	North Dakota	1, 000
District of Columbia	1, 800	Ohio	22, 400
Florida	4, 400	Oklahoma	3, 100
Georgia	5, 900	Oregon	1, 700
Idaho	800	Pennsylvania	33 700
Illinois	28, 100	Rhode Island	4, 600
Indiana	7, 800	South Carolina	2, 600
Iowa	4, 700	South Dakota	1, 300
Kansas	2, 400	Tennessee	7, 200
Kentucky	3, 300	Texas	9, 900
Louisiana	6, 900	Utah	1, 100
Maine	2, 900	Vermont	1, 500
Maryland	6, 900	Virginia	5, 500
Massachusetts	17, 100	Washington	4, 200
Michigan	27, 000	West Virginia	3, 000
Minnesota	6, 900	Wisconsin	9, 700
Mississippi	4, 700	Wyoming	200
Missouri	10, 100		
Montana	900	All States	400, 000
Nebraska	1, 700		

[1] The estimate is exclusive of Alaska, Hawaii, and Puerto Rico.

It will be observed that the rates vary widely by State. For Rhode Island the rate (of persons classified as not available for general military service) was 58.5 percent; for Wyoming, at the other extreme, it was 18.4. For a discussion of the significance of the variation from State to State it will be necessary to consult the report, "Defects Found in Drafted Men." It is manifest, however, that part of the variation is to be ascribed to real differences in the physical condition of men coming from different States, part to variations in the examination technique of local boards, and part to similar variations at the camps.

It is not practicable to say to what extent the differences among States in 1917–18 will be reflected in the new draft examinations. Insofar as the variation represents real geographic differences in physical status, it is plausible to expect a recurrence of the same phenomenon. Insofar as it represents a different average level of examination technique of local boards in different States, we may perhaps expect more or less conformity to the same pattern. Much of the variation by camps, however, must be regarded as dependent on a complicated set of circumstances, involving camp management as well as the proficiency of the medical staff.

DESCRIPTION OF DATA USED

The figures used for the number of men examined by the local boards are as given in the report, "Defects Found in Drafted Men." They comprise: (*a*) Men examined by local boards after December 15, 1917 (3,247,888), and (*b*) 516,212 men who had entrained for

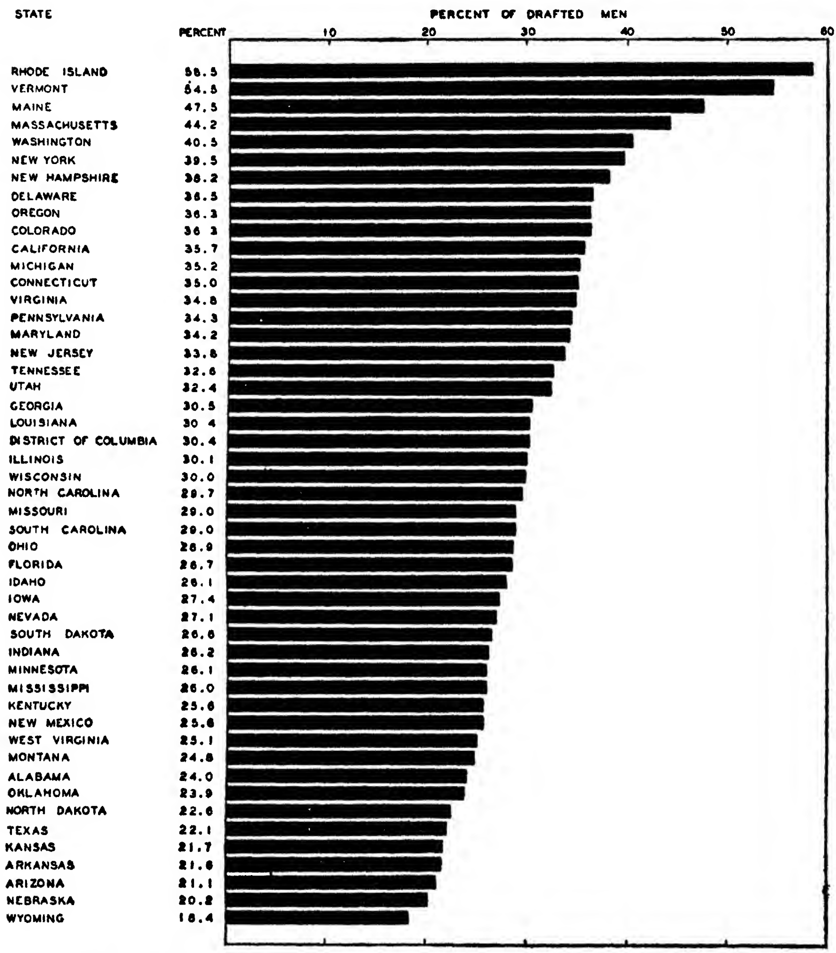

FIGURE 3.—Percentage of drafted men rejected or accepted for limited service only, by State.

camps in the first draft, prior to December 15. Most of the men were between the ages of 21 and 31. The figures on the number rejected by the local boards (549,099 for the whole country) are again those given in the report, "Defects Found in Drafted Men." Figures for the number of men placed in limited service groups by the local boards were obtained from a report of the Provost Marshal General.[9]

[9] Second Report of the Provost Marshal General to the Secretary of War on the Operations of the Selective Service System to December 20, 1918. Government Printing Office, Washington, 1919.

There were 427,813 such men, of whom 128,355 reached camp (by September 11, 1918).

The "second million" constituted a sample of 967,486 men out of 1,672,661 sent to camp after May 1, 1918 (excluding third registration, which extended the age limits to 18 to 45, and certain special groups). The sample for which data are shown in the report, "Defects Found in Drafted Men," was obtained by taking physical examination records from an alphabetical file beginning with the letter A and continuing through the letter N. As indicated, 994,206 camp examinations made prior to May 1, 1918 ("first million") are disregarded in the present summary.

All figures relate to white and colored persons combined.

Methods of calculation are described in the appendix.

DISCUSSION OF DETAILED TABLES

Table 3 gives the number of persons, by States, (*a*) examined and rejected by the local boards, or (*b*) falling into different physical status groups on the basis of camp examinations. In the succeeding tables the results of the local board and camp examinations are combined as described in the appendix.

TABLE 3.—*Number of men examined by local boards and at camp ("second million") according to physical status groups*

State	Local boards		Camps				
	Examined	Rejected	Examined	Accepted for general service		Accepted for limited service	Rejected
				With no defects	With defects		
Alabama	84, 985	7, 776	22, 604	14, 314	5, 506	401	2, 383
Alaska	2, 116	307	658	359	245	14	40
Arizona	11, 527	1, 432	2, 137	1, 330	661	85	61
Arkansas	70, 030	6, 531	20, 478	13, 323	5, 183	354	1, 618
California	102, 216	20, 823	19, 184	8, 735	7, 514	1, 679	1, 236
Colorado	29, 984	5, 387	8, 658	4, 431	3, 468	374	385
Connecticut	50, 898	8, 599	9, 982	5, 352	3, 122	910	598
Delaware	7, 338	886	1, 852	1, 098	451	109	193
District of Columbia	11, 364	1, 845	4, 580	2, 468	1, 561	298	253
Florida	35, 585	4, 501	12, 038	5, 968	4, 506	568	996
Georgia	93, 530	11, 810	24, 897	15, 016	6, 329	335	3, 217
Idaho	17, 911	2, 016	5, 480	3, 005	1, 890	172	413
Illinois	252, 001	36, 095	55, 969	33, 363	15, 366	2, 426	4, 814
Indiana	102, 459	13, 828	25, 022	16, 864	6, 252	882	1, 624
Iowa	89, 292	13, 839	27, 319	18, 706	6, 121	724	1, 768
Kansas	57, 586	5, 147	19, 124	14, 311	3, 021	465	1, 327
Kentucky	88, 890	14, 660	21, 657	15, 996	4, 160	434	1, 067
Louisiana	77, 106	11, 642	19, 885	12, 578	4, 790	273	2, 244
Maine	25, 185	6, 751	7, 666	4, 359	2, 063	411	833
Maryland	48, 775	10, 705	12, 692	7, 799	3, 753	628	512
Massachusetts	124, 302	23, 432	29, 476	15, 728	7, 817	2, 909	3, 022
Michigan	126, 743	19, 916	29, 300	15, 538	9, 036	1, 905	2, 821
Minnesota	97, 681	13, 274	23, 963	15, 427	5, 992	648	1, 896
Mississippi	63, 989	6, 629	17, 379	10, 462	4, 478	483	1, 956
Missouri	129, 926	17, 557	34, 244	20, 278	9, 604	1, 125	3, 237
Montana	39, 743	3, 917	9, 887	5, 538	3, 280	386	683
Nebraska	50, 578	3, 905	11, 237	7, 585	2, 491	382	779
Nevada	4, 832	596	971	599	269	37	66
New Hampshire	13, 115	1, 743	3, 678	1, 872	1, 176	338	292
New Jersey	107, 494	14, 717	23, 177	13, 652	6, 084	1, 084	2, 357
New Mexico	14, 830	2, 509	3, 426	2, 157	1, 048	66	155
New York	356, 419	50, 988	83, 850	48, 017	20, 483	6, 847	8, 503

TABLE 3.—*Number of men examined by local boards and at camp ("second million") according to physical status groups*—Continued

State	Local boards		Camps				
	Examined	Rejected	Examined	Accepted for general service		Accepted for limited service	Rejected
				With no defects	With defects		
North Carolina	82, 544	10, 819	23, 361	15, 365	4, 901	841	2, 254
North Dakota	28, 403	3, 099	6, 170	3, 601	1, 995	96	478
Ohio	193, 734	27, 347	46, 882	32, 607	9, 341	1, 957	2, 977
Oklahoma	81, 418	10, 947	24, 673	15, 617	7, 035	347	1, 674
Oregon	22, 458	3, 251	7, 946	3, 552	3, 295	302	797
Pennsylvania	290, 472	39, 265	67, 931	32, 343	23, 377	4, 257	7, 954
Rhode Island	15, 254	5, 633	4, 535	2, 440	1, 282	414	393
South Carolina	57, 952	7, 049	18, 002	11, 847	3, 736	240	2, 179
South Dakota	30, 327	4, 058	9, 359	6, 973	1, 577	161	648
Tennessee	85, 970	14, 960	22, 607	14, 795	4, 739	770	2, 303
Texas	166, 868	22, 590	45, 496	31, 567	11, 170	408	2, 351
Utah	15, 978	2, 516	3, 663	2, 036	1, 157	206	264
Vermont	10, 024	2, 873	2, 916	1, 394	975	256	291
Virginia	77, 410	11, 967	22, 119	9, 715	8, 279	978	3, 147
Washington	44, 953	9, 161	10, 369	5, 233	3, 696	613	797
West Virginia	58, 308	6, 123	17, 714	9, 011	6, 456	469	1, 778
Wisconsin	98, 413	12, 867	24, 356	13, 603	7, 747	849	2, 157
Wyoming	12, 065	774	3, 552	1, 689	1, 506	109	248
State not specified	----------	917	12, 765	7, 963	2, 963	409	1, 430
Grand total	3, 764, 101	549, 099	967, 486	577, 603	262, 050	41, 464	85, 469

As stated above, it was not possible to give data with respect to the number of men rejected for, or placed in limited service groups by reason of, specific defects. No classification was made in the draft report by men according to cause. In fact, more than one cause was frequently associated with the rejection or classification into limited service groups. The rates will therefore be given per 1,000 drafted men, but the impairments will be subdivided on the basis of the physical status group into which the men themselves were placed. The rates are shown in table 4 by diagnosis.[10]

[10] The draft diagnosis classification numbers (see table 5) of the conditions included under each of the categories listed in table 4 are as follows:

Orthopedic impairments:
- Crippled or paralyzed members (198-204, 207-215, 219, 225-227, 229, 232, 233, 237-247).
- Lost members:
  - Upper extremities:
    - Fingers (228).
    - Other (205).
  - Lower extremities (206, 223).
- Flat feet (221).
- Other specified foot defects (216-218, 220, 222, 224, 234, 236).
- Curvature of the spine (13, 61).

Eye defects:
- Defective vision (74-77, 84).
- Blindness in one or both eyes (85, 93-95).
- Trachoma (81).

Eye defects—Continued.
- Other eye defects (78-80, 80 (a), 82, 83, 86 92, 96-98).

Cardiovascular-renal diseases:
- Valvular diseases of the heart (119-127).
- Cardiac hypertrophy (128).
- Tachycardia (145).
- Functional heart diseases (51, 141, 142).
- Other (37-45, 117, 118, 129-134, 140, 143, 144, 175-177).

Underweight (26, 250, 252).

Hernia and inguinal rings:
- Hernia (164).
- Enlarged rings (165).

Tuberculosis (all forms) actual or suspected (6-8).

Defective and deficient teeth (153).

Nervous or mental diseases:
- Mental deficiency (66).

Nervous or mental diseases—Con.
- Epilepsy (46, 47).
- Mental alienation (64, 65, 67-73)
- Other (36, 48-50, 52, 52 (a), 53, 55-57, 62, 63).

Ear defects:
- Defective hearing (58-60, 102).
- Otitis media (99).
- Other ear diseases (100, 101, 103).

Venereal diseases:
- Gonorrhea (11).
- Syphilis (9).
- Chancroid (10).

Varicose veins, varicocele (136-137).

Goiter (18, 24).

Hypertrophic tonsillitis (115).

Arthritis and allied affections (16, 30, 54, 235).

Asthma (149).

Table 4.—*Prevalence of defects among drafted men, according to physical status classification*

Diseases or defects	Defects among rejected men per 1,000 drafted men		Defects among rejected or limited service men per 1,000 drafted men		Defects among rejected, limited service, or general service men per 1,000 drafted men	
Orthopedic impairments	56.64		105.28		213.16	
Crippled or paralyzed members		25.25		38.69		48.70
Lost members:						
Upper extremities.						
Fingers		2.46		5.24		7.57
Other		1.42		1.53		1.56
Lower extremities		3.19		3.88		4.56
Flat feet		11.83		32.41		101.37
Other specified foot defects		7.78		17.31		38.74
Curvature of the spine		4.71		6.22		7.66
Eye defects	32.05		53.48		61.01	
Defective vision		21.99		40.82		46.28
Blindness in one or both eyes		5.69		7.32		7.48
Trachoma		1.06		1.10		1.24
Other eye defects		3.31		4.24		6.01
Cardiovascular-renal diseases	38.90		47.20		50.20	
Valvular diseases of the heart		23.59		27.81		29.63
Cardiac hypertrophy		3.44		3.84		4.15
Tachycardia		3.70		4.82		5.04
Functional heart diseases		1.54		3.41		3.69
Other		6.63		7.32		7.69
Underweight	20.37		29.63		31.14	
Hernia and inguinal rings	15.64		25.81		55.36	
Hernia		14.38		20.96		27.56
Enlarged rings		1.26		4.85		27.80
Tuberculosis (all forms) actual or suspected	23.23		24.29		24.74	
Defective and deficient teeth	9.50		24.18		26.27	
Nervous or mental diseases	22.06		23.83		24.53	
Mental deficiency		11.37		12.00		12.23
Epilepsy		3.82		3.88		3.92
Mental alienation		3.39		3.70		3.79
Other		3.48		4.25		4.59
Ear defects	12.59		14.55		15.45	
Defective hearing		5.50		6.82		7.11
Otitis media		6.36		6.81		7.30
Other ear diseases		.73		.92		1.04
Venereal diseases	4.73		7.12		46.77	
Gonorrhea		2.20		4.15		36.03
Syphilis		2.41		2.78		9.51
Chancroid		.12		.19		1.23
Varicose veins, varicocele	3.99		6.15		8.75	
Goiter	4.01		5.66		11.38	
Hypertrophic tonsillitis	1.57		5.25		33.77	
Arthritis and allied affections	2.37		3.14		3.48	
Asthma	2.06		2.23		2.33	
Other diseases or defects	27.12		36.24		53.56	
All diseases or defects	276.83		414.05		661.94	

The three physical status groups employed are: (*a*) Rejected men; (*b*) men not accepted for general military service (i. e., rejected men plus those placed in limited service groups); and (*c*) total with some recorded defect (i. e., rejected men, plus those accepted for limited service, or accepted for general military service with recorded defect).[11] The second of these groups, (*b*), was utilized as a basis for the estimated numbers in table 1.

The three groups are presented separately to give as adequate a statement as possible of the rate of defects of varying degrees of severity likely to be encountered in the present conscription examina-

[11] The rates in table 4 are additive, those for the limited service groups being obtainable by subtraction of the first two columns from the third and fourth, respectively; those for the group accepted for general military service are obtainable by subtracting the third and fourth columns from the fifth and sixth, respectively.

tions; but, as indicated previously, the second concept is perhaps of chief interest—the rate of defects (per 1,000 total drafted men) noted among persons who were not qualified for general military service.

As a basis for more intensive study, in table 5 the rates are given according to the detailed diagnosis list of the draft report. To save space the table is limited to men who were not available for general military service.

TABLE 5.—*Prevalence of defects noted in men who were rejected or accepted for limited service only. Detailed diagnosis list*

Diseases or defects	Draft classification No.	Defects among rejected or limited service men per 1,000 drafted men
I. Infectious diseases (excluding tuberculosis and venereal):		
Dysentery	1	0.030
Mycosis	2	014
Pellagra	3	.08
Infectious diseases, carriers of	4	020
Infectious diseases, other	5	.47
II. Tuberculosis.		
Tuberculosis, pulmonary	6	17 02
Suspected tuberculosis or weak lungs	7	4 70
Tuberculosis of other organs	8	2 58
III. Venereal diseases (all).		
Syphilis	9	2 78
Chancroid	10	19
Gonococcus infection	11	4 15
IV. General diseases (other):		
Rickets	12	.039
Curvature of spine	13	5 11
Cancer and other tumors, malignant	14	14
Tumors, benign	15	.42
Arthritis	16	2 63
Diabetes mellitus	17	.20
Goiter, exophthalmic	18	3 59
Cretinism and myxedema	19	.018
Addison's disease	20	.004
Gigantism	21	.001
Acromegaly	21a	.012
Leukemia	22	.004
Hodgkin's disease	23	015
Goiter, simple	24	2 07
Ductless glands, other diseases of	25	.23
Anemia	26	.15
Hemophilia	27	024
Obesity	28	2 05
Purpura	29	.005
Muscular rheumatism	30	.35
General diseases, other	31	.10
Alcoholism	32	.31
Drug addiction	33	.61
Poisoning, chronic	34	036
Miner's consumption (anthracosis)	35	.011
V. Nervous system, diseases of (all):		
Tabes dorsalis	36	.16
Multiple sclerosis	37	.11
Hemiplegia and apoplexy	38	.55
Facial paralysis	39	09
Paraplegia	40	.32
Monoplegia	41	1.15
Ocular muscle, paralysis of	42	.004
Nerve, paralysis of	43	.043
V. Nervous system, diseases of (all)—Continued.		
Muscle, paralysis of	44	0 09
Paralysis (location and cause not given)	45	38
Epilepsy	46	3 87
Jacksonian epilepsy	47	008
Neurasthenia	48	.72
Enuresis	49	.07
Neurosis	50	.11
Neuro-circulatory asthenia (disordered action of the heart)	51	.51
Chorea	52	.17
Huntington's chorea	52a	001
Hysteria	53	.28
Neuritis	54	.11
Speech, defective	55	1 21
Migraine	56	.012
Tic	57	.037
Deaf and dumb	58	.64
Mute	59	.09
Deaf	60	.93
Spine, deformity or disease of (details not given)	61	1 10
Spinal cord, other diseases of	62	.38
Nervous system, other diseases of	63	1.10
VI. Mental alienation:		
General paralysis of the insane	64	.09
Constitutional psychopathic states	65	.75
Mental deficiency	66	12 00
Malingering	67	001
Dementia praecox	68	.65
Psychasthenia	69	.13
Psychoneurosis	70	.84
Psychosis, alcoholic	71	.019
Psychosis, manic depressive	72	.17
Psychosis, other	73	1.04
VII Eyes and their annexa, diseases of:		
Astigmatism	74	1.24
Hyperopia	75	.92
Myopia	76	2.82
Defective vision (cause not stated)	77	34.19
Strabismus	78	1.00
Leucoma	79	.15
Cataract	80	.81
Aphakia	80a	----------
Trachoma (conjunctivitis, granular)	81	1.10
Conjunctivitis, other	82	.17
Pterygium	83	.05

Table 5.—*Prevalence of defects noted in men who were rejected or accepted for limited service only. Detailed diagnosis list*—Continued

Diseases or defects	Draft classification No	Defects among rejected or limited service men per 1,000 drafted men
VII. Eyes and their annexa, diseases of—Continued.		
Amblyopia	84	1.65
Amaurosis	85	.031
Choroiditis	86	.43
Keratitis	87	.11
Retinitis	88	.14
Nystagmus	89	.29
Glaucoma	90	.048
Eyelid, disease of	91	.14
Color blindness	92	.016
Eye, enucleation of	93	1.51
Blindness in one eye	94	5.30
Blindness in both eyes	95	.49
Ocular hemorrhage	96	.006
Opacity of the cornea (cause not stated)	97	.09
Eye, other diseases of	98	.80
VIII. Ear, diseases of		
Otitis media	99	6.81
Perforated eardrum	100	.68
Otitis, external	101	.007
Defective hearing	102	5.17
Ear, other diseases of	103	.23
IX. Nasal fossae, diseases of		
Adenoids	104	.006
Deviation of the nasal septum	105	.22
Nose, external deformity of	106	.005
Turbinate, hypertrophy of	107	.017
Sinusitis	108	.63
Polypus, nasal	109	.028
Perforated nasal septum	110	.006
Ozena	111	.08
Rhinitis	112	.26
Nasal fossae, other diseases of	113	.29
X. Throat, diseases of:		
Larynx, diseases of	114	.049
Tonsillitis, hypertrophic	115	5.25
Tonsils, focal infection from	115a	.021
Tonsils, other diseases of	115b	.28
Pharynx, diseases of	116	.11
XI. Circulatory system, diseases of:		
Pericarditis	117	.043
Endocarditis	118	.77
Valvular diseases of the heart	119	------
Aortic insufficiency	120	1.22
Aortic stenosis	121	.39
Mitral insufficiency	122	9.78
Mitral stenosis	123	2.39
Combined lesions, aortic and mitral	124	.41
Pulmonic lesions	125	.10
Tricuspid lesions	126	.032
Valvular lesions, unclassified	127	13.49
Cardiac hypertrophy	128	3.84
Cardiac dilatation	129	.39
Myocarditis	130	.56
Myocardial insufficiency	131	.35
Aneurisms	132	.049
Arteriosclerosis and hypertension	133	.53
Aortitis	134	.002
Hemorrhoids	135	1.07
Varicocele	136	1.78
Varicose veins	137	4.36
Phlebitis	138	.24
Lymphatic system, diseases of	139	.22

Diseases or defects	Draft classification No.	Defects among rejected or limited service men per 1,000 drafted men
XI. Circulatory system, diseases of—Continued.		
Cardiac arrhythmias	140	0.66
Cardiac murmurs, not organic	141	.55
Cardiac disorders, functional	142	2.36
Bradycardia	143	.018
Heart block	144	.007
Tachycardia	145	4.82
Circulatory system, other diseases of	146	.33
XII. Respiratory system, diseases of:		
Bronchitis	147	.72
Pleurisy	148	.48
Asthma	149	2.23
Hay fever	150	.010
Emphysema	151	.46
Respiratory system, other diseases of (except pulmonary tuberculosis)	152	.36
XIII. Digestive system, diseases of		
Defective and deficient teeth	153	24.18
Dental caries	154	.07
Pyorrhea alveolaris	155	.23
Mouth and annexa, other diseases of	156	.07
Esophagus, diseases of	157	.023
Ulcer of the stomach	158	.23
Stomach, other diseases of	159	.11
Diarrhea and enteritis	160	.08
Ankylostomiasis (uncinariasis, hookworm)	161	.012
Intestinal parasites	162	.045
Appendicitis	163	.11
Hernia	164	20.96
Inguinal rings, enlargement of	165	4.85
Intestinal obstruction	166	.033
Fistula in ano	167	.39
Fistula, fecal	168	.016
Intestines, other diseases of	169	.15
Cirrhosis of the liver	170	.026
Liver, gall bladder, and gall ducts, other diseases of	171	.13
Peritoneal adhesions	172	.07
Visceroptosis	173	.009
Digestive system, other diseases of	174	.17
XIV. Genitourinary system, diseases of (nonvenereal):		
Nephritis	175	.60
Nephroptosis	176	.015
Kidney and annexa, other diseases of	177	.58
Nephrolithiasis	178	.05
Bladder, diseases of	179	.29
Urinary fistula	180	.06
Urethra, diseases of	181	.11
Prostate, diseases of	182	.036
Hydrocele	183	.70
Genitourinary system, other diseases of (nonvenereal)	184	.67
XV. Skin and cellular tissue, diseases of		
Cellulitis	185	.006
Trichophytosis	186	.007
Nails, defect and disease of	187	.027
Ectoparasites	188	.028

TABLE 5.—*Prevalence of defects noted in men who were rejected or accepted for limited service only. Detailed diagnosis list*—Continued

Diseases or defects	Draft classification No.	Defects among rejected or limited service men per 1,000 drafted men
XV. Skin and cellular tissue, diseases of—Continued.		
Bromidrosis	189	0 026
Raynaud's disease	190	.004
Keloid	191	.024
Large scar of face	192	.018
Abdominal scar	193	.32
Painful cicatrices	194	.30
Cicatricial contracture	195	.50
Cicatricial deformities	196	.41
Skin and cellular tissue, other diseases of	197	2.01
XVI. Bones and organs of locomotion, diseases of:		
Fracture, malunion of, upper extremity	198	2 26
Fracture, malunion of, lower extremity	199	3 35
Fracture, malunion of, other than of extremities	200	.29
Fracture, faulty union of, location not given	201	----------
Fracture, nonunion of, upper extremity	202	.08
Fracture, nonunion of, lower extremity	203	.10
Lower extremity, shortening of	204	3.30
Upper extremity, loss of whole or part of	205	1.53
Lower extremity, loss of whole or part of	206	2 41
Ankylosis, bony, of joint	207	4 56
Ankylosis, fibrous, of joint	208	3 18
Joint, contracture of	209	.05
Bursitis	210	.07
Tenosynovitis	211	.024
Joint, relaxed ligaments of	212	.24
Joint, resection of	213	.002
Chronic dislocation (other than hand)	214	1.04
Muscle, fascia, tendon, sheath, contracture of	215	1 22
Hammertoe	216	1.13
Hallux valgus	217	2.75
Plantar fascia, contracture of	218	.08
Palmar fascia, contracture of	219	004
Pes cavus	220	1 20
Pes planus	221	32 41
Pronated foot	222	7.08
Foot, loss of part of	223	1.47
Foot, deformity of (cause or type not specified)	224	2.68
Ganglion	225	.024
Skull, depressed fracture of	226	.65
Hand, deformities of (result of old injury or infection)	227	2 09
XVI. Bones and organs of locomotion, diseases of—Con.		
Fingers, loss of one or more	228	5 24
Osteitis deformans	229	.049
Recent operation wound	230	.24
Scar on head	231	.011
Hernia of muscle	232	.012
Exostoses	233	.27
Metatarsalgia	234	1 64
Myositis	235	.022
Talipes	236	.74
Deformity of (location not given)	237	.65
Upper extremity, deformity of	238	2 08
Lower extremity, deformity of	239	4 19
Trunk, deformity of	240	.20
Head, deformity of	241	23
Chest, deformity of	242	1 32
Upper extremity, atrophy of muscle of	243	.72
Lower extremity, atrophy of muscle of	244	1 89
Osteitis	245	.038
Divided ligament, muscle or tendon	246	.14
Bones and organs of locomotion, other diseases of	247	4 38
XVII Congenital malformations and ill-defined diseases.		
Defective physical development	248	2 34
Deficient chest measurement	249	.72
Underweight	250	20 24
Under height	251	3 02
Malnutrition	252	.24
Anorchism	253	.021
Monorchism	254	09
Cryptorchidism	255	1.71
Hypospadia	256	.13
Gynandrism	257	034
Masochism	258	.001
Impacted molar	259	.002
Cleft palate	260	.40
Harelip	261	.09
Spina bifida	262	.018
Albinism	263	.019
Fistula, other	264	.19
Bullet or other recent wounds	265	.49
General unfitness for military service	266	4 29
Ill-defined diseases	267	1.20
Diseases not specified	268	2.79
Other malformations or ill-defined diseases	269	11

In table 6 the percentage of men falling into the three specified cumulative physical status groups is presented by States, the States being arrayed in the table in accordance with the rates for the second of the three groups.

Table 6.—*Percentage of drafted men in specified physical status groups*

State	Percentage rejected	Percentage rejected or accepted for limited service only	Percentage with one or more recorded defects	State	Percentage rejected	Percentage rejected or accepted for limited service only	Percentage with one or more recorded defects
Rhode Island	41.3	58 5	72.7	North Carolina	20 7	29 7	46.2
Vermont	34 2	54.5	73 1	Missouri	21 0	29 0	51 3
Maine	33 5	47 5	64 2	South Carolina	22.0	29 0	47 4
Massachusetts	25 6	44.2	62 0	Ohio	18 8	28 9	43.7
Washington	25 3	40 5	64.1	Florida	19 3	28.7	59 4
New York	23 9	39 5	56.8	Idaho	17 3	28.1	55 3
New Hampshire	18 8	38 2	61 7	Iowa	20 5	27.4	45 1
Delaware	19.7	36 5	53 5	Nevada	17.4	27 1	48.0
Oregon	21 8	36 3	66 7	South Dakota	18 8	26 6	39.4
Colorado	20 8	36 3	63 6	Indiana	18 4	26.2	45 6
California	24 7	35 7	65.2	Minnesota	19 9	26 1	46.3
Michigan	22 7	35 2	58 4	Mississippi	19 9	26.0	47.9
Connecticut	20 8	35 0	58 1	Kentucky	20 3	25.6	40 3
Virginia	26 7	34 8	64.8	New Mexico	20 3	25 6	49 3
Pennsylvania	22 5	34 3	61 3	West Virginia	19.0	25.1	56 2
Maryland	24 6	34 2	55 4	Montana	15 4	24.8	52 0
New Jersey	21.2	33 8	52.3	Alabama	18 1	24 0	44 4
Tennessee	25 2	32 6	48 6	Oklahoma	19.0	23 9	47 2
Utah	20 9	32 4	56.1	North Dakota	17.3	22.6	49 2
Georgia	23 0	30 5	50 0	Texas	17.7	22.1	41 9
Louisiana	24 0	30 4	48.7	Kansas	14 8	21 7	35 1
District of Columbia	17 0	30.4	57 3	Arkansas	16 0	21 6	43 1
				Arizona	14.4	21 1	46 5
Illinois	20 9	30 1	51 2	Nebraska	13 8	20.2	39 3
Wisconsin	19.9	30.0	54.4	Wyoming	12.6	18.4	56.8

Causes of the wide variation in the rates from State to State have already been discussed. It will be noted that this tendency is present in each of the three groups of defects.

In table 7 the data by diagnosis are presented for each State, again employing, for brevity, the rate (per 1,000 total drafted men) of defects noted in men who were not available for general military service.

Table 7.—*Prevalence of defects (per 1,000 total drafted men) noted in men who were rejected or accepted for limited service, by State*

Diseases or defects	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia
Orthopedic impairments	70 45	84 23	72.56	136.98	162 76	110.13	151.81	101 85	109 52	84 94
Crippled or paralyzed members	30.24	26.11	26 03	39 06	41.76	37.31	69 09	46 78	43 35	39 75
Lost members:										
Upper extremities:										
Fingers	4 19	4.77	3 34	3 89	8 97	6 23	4 50	3.69	4.48	4 43
Other	1 01	.52	1 13	1 52	1.70	1 43	41	.70	1 46	1.70
Lower extremities	3 57	2.60	3 14	4 34	4 50	4 01	2 73	2 85	3 97	3 69
Flat feet	16 99	45.72	27.27	69 51	87.75	36 70	29 84	23 60	31.09	15 52
Other specified foot defects	10.48	3.21	9.22	11.47	8 14	17 53	32 98	17 06	19 45	14 23
Curvature of the spine	3.97	1.30	2 43	7.18	6.94	6 92	12 26	7.17	5 72	5 62
Eye defects	20.51	26.47	32.57	41 75	60.93	70.04	64 06	61 89	41 99	41 26
Defective vision	17.01	17.87	20.52	31.69	44.19	61.52	51.38	48 38	29 44	27 39
Blindness in one or both eyes	6.06	5.73	6.07	7.03	11.07	5.58	3 82	7.59	7.52	10.53
Trachoma	.80	1.13	2.30	.46	.57	.35	.41	.84	.56	.13
Other eye defects	2.64	1.74	3.68	2.57	5.10	2.59	8.45	5.08	4.47	8.21

TABLE 7.—*Prevalence of defects (per 1,000 total drafted men) noted in men who were rejected or accepted for limited service, by State*—Continued

Diseases or defects	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia
Cardiovascular-renal diseases	40.57	34.35	38.57	70.83	52 39	46.43	37 89	56 25	39.75	42 63
Valvular diseases of the heart	20.50	26.29	19 21	51 30	35 19	25.86	20 71	30.21	21 23	24 91
Cardiac hypertrophy	2 85	1.04	1 56	4 49	2 90	3 52	1 64	4 39	3 83	3.16
Tachycardia	5 95	1.47	2 03	5 49	5 37	3 56	5 86	10 65	5 47	5.50
Functional heart diseases	5.57	.95	11 17	.47	1.13	1.96	6.95	4.18	1.14	2 13
Other	5.70	4.60	4 60	9 08	7.80	11 53	2 73	6 82	8.08	6 84
Underweight	20 70	8 85	14 38	31.92	28.85	35 29	56.69	37.66	32 93	49 68
Hernia and inguinal rings	25 91	9 72	25 68	24.15	27 91	22 95	31.21	20 95	32 64	24 27
Hernia	23 71	7.29	23.72	19 54	20 01	12 73	26.44	15 94	29 06	21 02
Enlarged rings	2.20	2 43	1.96	4.61	7 90	10 22	4.77	5.01	3 58	3 25
Tuberculosis (all forms), actual or suspected	20 33	61.25	17.09	54 86	52.46	25 48	15 40	21.09	18 93	20 58
Defective and deficient teeth	9 30	7.29	2 90	14 02	10 24	36 52	35.02	16 15	23 03	21 19
Nervous or mental diseases	24.54	5 99	21 52	19 04	20 01	20 67	15 95	21 52	21 18	23 99
Mental deficiency	13 39	2.00	15 09	7.61	9.27	9 43	8 18	8 98	10 69	12.59
Epilepsy	2 72	95	2 90	3 84	4 37	4 46	3 27	4 25	4 61	2 99
Mental alienation	4.51	1.74	1 53	3.96	3 27	3 36	1 09	3 90	2 79	4 60
Other	3 92	1 30	2 00	3 63	3 10	3 42	3 41	4 39	3 09	3 81
Ear defects	7.06	6 16	6 65	16 92	15 07	19 76	9 27	14 83	6 77	6 97
Defective hearing	4 14	2 52	3.87	7 55	8 27	9 88	4.63	8 91	4 95	4 50
Otitis media	2 61	3.38	2 27	8 05	5 30	8 49	4 50	5 08	1 29	1 95
Other ear diseases	.31	.26	.51	1.32	1.50	1 39	.14	.84	53	.52
Venereal diseases	11 16	6 07	8 88	7.10	5 44	3 23	11 18	11 83	28 63	15 11
Gonorrhea	5 57	1 56	5.35	3 67	3 74	2 22	5 45	6 75	19 70	8 14
Syphilis	5 33	4 51	3 34	3 34	1 57	83	5.59	4 80	8 29	6 76
Chancroid	.26	---- --	19	09	.13	18	.14	28	64	.21
Varicose veins, varicocele	4.60	2 34	4 77	5.52	7 37	7 35	6 13	6 27	4 58	5 40
Goiter	1 09	.43	.97	3 37	5 64	2 42	1 09	5 36	1 14	2 26
Hypertrophic tonsillitis	3 32	1 56	5 23	3 76	2 57	8 51	2 73	5 71	1 58	2 08
Arthritis and allied affections	4 34	1.21	2 46	3 05	1 77	1 95	1 50	2 30	6 57	5 86
Asthma	2 09	2 26	2 41	3 16	5 00	3 40	1 91	28	3 04	1 80
Other diseases or defects	28 70	16 14	24.79	38 95	35 42	37 09	54.51	39 89	38 83	49 78
All diseases or defects	300 67	274 32	281 43	475 37	493 83	451.22	496 35	423 83	411.11	397 80

Diseases or defects	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts
Orthopedic impairments	148 14	108 10	93 00	90 89	98 96	65 31	85 95	154 93	93.73	121 26
Crippled or paralyzed members	33 39	36 40	30 90	37.30	35 91	30 51	35 09	57 61	43 08	41 91
Lost members.										
Upper extremities:										
Fingers	6 31	5 27	5 39	6 23	6 10	3 66	5 63	8 81	4 33	7.09
Other	73	1 47	1 55	1 23	1 04	1.63	2 13	1 59	1 58	1 49
Lower extremities	3 91	4 10	3.65	3 62	3 28	3 97	3 89	3 97	3 71	2 90
Flat feet	76 77	40 37	34 17	23 28	40 18	11 13	27 29	36 33	21 86	31 96
Other specified foot defects	18 54	13 84	10 83	12 44	7 59	8 55	8 90	35 38	11 52	27 75
Curvature of the spine	8 49	6 56	6 51	6 79	4 86	5 86	3 02	11 24	7 65	8.16
Eye defects	39 85	55 57	39 66	42 79	35.90	43 50	41.08	74 02	64 55	87 79
Defective vision	29.31	42 35	28 24	31 08	24 12	23.86	26 13	65 08	51.95	76 72
Blindness in one or both eyes	6 92	7 76	7 30	6 92	7.19	9 94	10 05	5 64	7.48	7 02
Trachoma	.61	1 10	1 08	56	75	5.80	84	16	.12	.22
Other eye defects	3 01	4 36	3 04	4 23	3 84	3 90	4.06	3 14	5.00	3.83
Cardiovascular-renal diseases	54 61	40 43	35 92	53 29	31 73	26.64	43 26	76.40	58 44	58 18
Valvular diseases of the heart	44 39	25.60	20 67	28.02	19 92	16.01	26.00	32.72	39.28	32.97
Cardiac hypertrophy	2.85	2 87	2 92	4 71	1 98	1.24	2 44	6 43	5.88	4.80
Tachycardia	2 96	3.65	3.71	4 95	5 52	2 96	5 10	6 91	4.28	3 72
Functional heart diseases	.33	1.65	1.46	7 30	56	1 18	4 27	1 99	1.46	5 99
Other	4 08	6 66	7 16	8.31	3 75	5 25	5 45	28 35	7.54	10 70
Underweight	15 69	26 94	21.88	24.53	10.91	30.82	26.38	59.56	32.82	63.98
Hernia and inguinal rings	29 87	23 91	21 66	24.09	23 32	16.54	28.64	34.98	17.81	25 76
Hernia	22 17	18 60	19 26	22 29	21.05	15.46	25.96	24.50	12 03	18.62
Enlarged rings	7.70	5.31	2 40	1 80	2.27	1.08	2.68	10 48	5.78	7.14
Tuberculosis (all forms) actual or suspected	14 91	21 99	24 53	18.09	22.04	33.96	27.56	31.17	37.93	23.51
Defective and deficient teeth	16.58	17.48	9 47	12.76	3.89	8 75	23 71	79 45	21.28	78.82
Nervous or mental diseases	13 57	20 43	24.18	27.19	20 60	30 59	28.67	39 98	41.18	23.28
Mental deficiency	7.82	8.53	12.00	13 95	9.00	17.52	18.48	25.25	25 50	9.71
Epilepsy	2.29	3.55	4.40	3.89	2.71	4.12	4 18	5.40	6.15	4.38
Mental alienation	1.62	4.21	3.42	4.77	4.55	3.90	2.57	3.06	4.90	4.51
Other	1.84	4.14	4.36	4.58	4 34	5.05	3.44	6.27	4 63	4 68

Table 7.—*Prevalence of defects (per 1,000 total drafted men) noted in men who were rejected or accepted for limited service, by State*—Continued

Diseases or defects	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts
Ear defects	13.56	14.39	11.95	14.00	7.55	12.08	10.35	23.82	18.25	19.69
Defective hearing	5.19	6.89	6.76	7.94	4.29	7.01	7.02	13.02	9.78	8.37
Otitis media	5.30	6.52	4.68	5.30	2.74	4.63	2.72	10.20	7.38	9.94
Other ear diseases	3.07	.98	.51	.76	.52	.44	.61	.60	1.03	1.38
Venereal diseases	6.15	6.54	6.41	3.21	5.59	5.00	21.01	5.76	7.41	4.46
Gonorrhea	5.14	3.51	2.87	1.86	3.49	1.99	9.79	4.05	4.08	2.97
Syphilis	.95	2.87	3.52	1.32	1.98	2.83	10.45	1.63	3.10	1.42
Chancroid	.06	.16	.02	.03	.12	.18	.77	.08	.23	.07
Varicose veins, varicocele	4.75	5.51	5.50	5.05	3.47	4.79	5.58	12.51	4.03	10.64
Goiter	12.62	10.65	6.42	5.16	4.12	2.43	1.13	2.46	3.55	.97
Hypertrophic tonsillitis	2.07	3.17	3.33	3.85	1.13	2.08	4.32	8.30	3.53	7.55
Arthritis and allied affections	4.91	2.56	2.92	2.62	3.14	1.97	4.82	4.41	3.57	2.88
Asthma	1.28	1.73	2.47	2.83	1.22	1.78	3.19	5.80	1.46	2.94
Other diseases or defects	26.63	30.13	29.71	32.66	23.88	35.12	32.54	46.77	33.69	54.61
All diseases or defects	405.19	389.53	342.01	363.01	297.45	321.36	388.19	660.32	443.26	586.32

Diseases or defects	Michigan	Minnesota	Mississippi	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico
Orthopedic impairments	132.45	92.78	89.03	102.81	127.87	68.40	118.17	125.74	96.57	74.18
Crippled or paralyzed members	42.91	34.54	41.30	35.75	31.23	27.64	38.49	37.97	35.31	28.12
Lost members.										
Upper extremities.										
Fingers	9.70	4.49	4.53	3.97	4.91	3.89	6.42	8.92	3.79	2.63
Other	1.55	1.67	1.63	1.19	1.01	.83	1.24	1.07	1.38	1.62
Lower extremities	3.61	3.76	3.52	3.12	2.06	3.01	4.97	2.21	2.85	3.30
Flat feet	44.19	31.43	23.00	39.75	72.31	21.27	38.49	40.34	26.42	26.37
Other specified foot defects	24.96	10.67	10.72	12.78	11.47	7.63	19.25	28.67	20.18	9.51
Curvature of the spine	5.53	6.22	4.33	6.25	4.88	4.13	9.31	6.56	6.64	2.63
Eye defects	58.58	39.04	30.53	48.39	33.32	36.35	43.26	55.44	60.09	45.79
Defective vision	45.86	28.94	17.99	35.80	24.94	27.48	30.22	47.66	50.23	29.13
Blindness in one or both eyes	7.74	7.31	7.58	5.63	6.06	5.67	5.59	5.41	5.69	10.52
Trachoma	.47	.44	.47	2.22	.53	.95	1.45	.08	.44	1.35
Other eye defects	4.51	2.35	4.49	4.74	1.79	2.25	6.00	2.29	3.73	4.79
Cardiovascular-renal diseases	73.50	37.80	28.31	44.38	46.60	31.53	39.73	44.37	43.35	29.88
Valvular diseases of the heart	43.64	22.34	15.16	26.21	34.32	18.80	25.66	22.19	26.58	17.13
Cardiac hypertrophy	6.42	3.33	1.72	3.34	4.55	2.04	7.04	2.97	2.93	2.02
Tachycardia	8.49	3.07	4.49	5.19	1.66	3.22	2.48	4.50	3.57	2.43
Functional heart diseases	7.12	2.06	2.19	3.54	1.21	1.84	.62	4.19	4.11	3.98
Other	7.83	7.00	4.75	6.10	4.86	5.63	3.93	10.52	6.16	4.32
Underweight	24.62	23.26	15.46	25.22	8.83	9.57	26.90	45.37	34.54	23.13
Hernia and inguinal rings	28.02	24.42	26.68	25.02	23.80	17.46	25.66	25.47	27.93	15.23
Hernia	23.26	20.60	23.71	21.40	20.96	17.16	19.66	22.19	21.85	14.83
Enlarged rings	4.76	3.82	2.97	3.62	2.84	.30	6.00	3.28	6.08	.40
Tuberculosis (all forms) actual or suspected	20.26	17.68	21.18	26.34	11.93	12.50	20.07	15.78	20.62	58.60
Defective and deficient teeth	34.50	20.06	13.31	6.52	23.17	6.13	13.45	92.03	52.38	5.93
Nervous or mental diseases	19.96	20.31	30.55	27.27	8.93	14.09	9.11	19.52	15.31	20.15
Mental deficiency	9.88	10.29	18.43	13.78	3.47	6.17	4.97	10.14	6.83	12.74
Epilepsy	3.04	2.93	4.70	4.03	1.81	2.31	2.07	4.50	3.05	2.76
Mental alienation	3.02	3.22	3.23	3.63	1.89	3.26	1.24	1.98	1.96	2.56
Other	4.02	3.87	4.19	5.83	1.76	2.35	.83	2.90	3.47	2.09
Ear defects	15.56	12.45	7.87	13.49	12.60	6.08	15.52	16.32	18.40	12.95
Defective hearing	6.86	6.18	4.42	7.29	5.51	3.60	8.69	9.99	7.49	7.15
Otitis media	7.89	5.53	3.25	5.49	5.43	2.10	4.55	4.88	9.62	4.72
Other ear diseases	.81	.74	.20	.71	1.66	.38	2.28	1.45	1.29	1.08
Venereal diseases	5.80	3.38	25.55	8.08	4.53	3.48	3.73	2.89	4.44	3.57
Gonorrhea	3.50	1.92	15.57	4.18	3.20	2.02	2.07	1.75	3.19	2.56
Syphilis	2.20	1.41	8.92	3.55	1.33	1.44	1.66	1.14	1.16	1.01
Chancroid	.10	.05	1.06	.35	------	.02	------	------	.09	----
Varicose veins, varicocele	8.09	7.73	4.70	5.36	4.76	3.34	6.00	9.68	6.17	2.09
Goiter	11.63	8.18	1.48	8.17	8.76	2.33	6.42	1.60	2.16	1.15
Hypertrophic tonsillitis	3.19	1.58	4.80	7.16	1.23	1.90	3.52	6.71	5.20	3.44
Arthritis and allied affections	3.60	2.96	4.92	3.51	1.89	2.19	2.48	2.59	1.65	2.83
Asthma	2.16	1.57	2.09	2.22	1.69	1.06	1.66	2.44	.92	1.96
Other diseases or defects	31.35	29.62	31.54	31.05	19.17	21.51	32.08	48.11	37.20	27.71
All diseases or defects	478.27	342.82	338.00	384.99	339.08	238.52	367.76	514.06	426.93	328.59

TABLE 7.—*Prevalence of defects (per 1,000 total drafted men) noted in men who were rejected or accepted for limited service, by State*—Continued

Diseases or defects	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota
Orthopedic impairments	115.33	108.56	76.98	107.86	75.20	194.85	110.32	208.61	99.67	104.10
Crippled or paralyzed members	38.54	46.80	30.53	42.30	37.40	48.36	41.52	75.78	42.85	43.16
Lost members:										
Upper extremities:										
Fingers	5.10	5.09	3.61	7.53	3.46	8.01	5.18	8.72	4.62	6.56
Other	1.22	1.90	1.68	1.68	1.61	1.25	1.97	2.03	2.00	.79
Lower extremities	3.19	4.05	3.47	5.76	4.24	4.32	5.31	5.64	3.57	2.84
Flat feet	32.36	22.72	20.18	28.40	14.26	106.42	23.82	73.10	21.83	31.16
Other specified foot defects	27.54	22.04	12.53	15.37	9.21	18.52	26.56	34.42	19.38	11.74
Curvature of the spine	7.38	5.96	4.98	6.82	5.02	7.97	5.96	8.92	5.42	7.85
Eye defects	92.89	43.37	36.18	47.05	45.75	52.90	59.88	97.02	40.78	44.75
Defective vision	79.64	31.56	23.80	36.02	25.38	39.10	46.61	79.06	27.66	34.52
Blindness in one or both eyes	6.79	6.89	7.79	6.52	9.64	10.29	7.06	8.59	5.37	4.95
Trachoma	1.26	.22	2.91	.27	6.64	.62	.35	2.16	.71	1.85
Other eye defects	5.20	4.70	1.68	4.24	4.09	2.89	5.86	7.21	7.04	3.43
Cardiovascular renal diseases	58.47	37.79	31‸66	42.20	33.95	81.81	52.28	65.94	37.66	48.27
Valvular diseases of the heart	36.48	21.07	18.78	23.99	17.78	62.61	27.78	40.51	17.72	21.60
Cardiac hypertrophy	4.69	3.33	3.19	3.73	1.98	5.79	5.32	4.98	4.94	3.59
Tachycardia	4.03	4.94	2.07	4.82	3.73	4.68	6.63	3.08	5.11	9.30
Functional heart diseases	4.80	1.28	2.60	2.27	2.80	1.16	4.91	4.30	2.28	2.14
Other	8.47	7.17	5.02	7.39	7.64	7.57	7.64	12.98	7.61	8.64
Underweight	41.82	28.95	9.86	25.73	19.50	19.24	28.34	106.33	40.95	11.15
Hernia and inguinal rings	27.87	21.91	15.23	21.52	25.18	48.35	30.99	28.91	23.35	17.78
Hernia	19.15	18.63	13.37	16.82	22.71	29.03	21.80	24.71	20.50	15.83
Enlarged rings	8.72	3.28	1.86	4.70	2.47	19.32	6.19	4.20	2.85	1.95
Tuberculosis (all forms) actual or suspected	25.88	27.54	12.49	21.44	19.79	26.40	21.38	41.69	10.29	17.97
Defective and deficient teeth	46.13	17.07	19.02	14.62	6.95	27.38	29.08	79.26	18.81	20.91
Nervous or mental diseases	22.45	36.29	16.82	24.06	23.36	21.24	22.82	32.78	33.70	20.88
Mental deficiency	8.46	21.10	9.41	11.11	13.85	8.42	10.35	15.08	17.86	13.49
Epilepsy	4.58	4.91	2.46	4.43	3.66	2.94	4.06	6.23	3.71	.96
Mental alienation	5.01	4.18	2.11	4.00	2.80	4.36	3.59	4.52	5.02	3.00
Other	4.40	6.01	2.84	4.52	3.05	5.52	4.82	6.95	7.11	3.43
Ear defects	22.99	9.46	13.79	13.42	13.70	16.52	19.63	29.56	8.37	13.16
Defective hearing	8.39	7.05	6.39	6.04	7.05	7.30	6.16	13.44	5.88	6.86
Otitis media	13.06	2.02	6.14	6.70	5.97	5.66	12.50	15.14	1.78	5.18
Other ear diseases	1.54	.39	1.26	.68	.68	3.56	.97	.98	.71	1.12
Venereal diseases	4.15	10.52	.95	4.70	6.95	4.50	5.43	5.83	12.98	3.82
Gonorrhea	2.40	6.75	.56	2.92	2.98	3.61	3.41	3.54	7.68	2.04
Syphilis	1.61	3.55	.28	1.74	3.91	.89	1.82	2.29	4.83	1.75
Chancroid	.14	.22	.11	.04	.06	-------	.20	------	.47	.03
Varicose veins, varicocele	7.44	7.01	5.51	5.92	4.08	9.04	5.45	12.65	5.69	3.56
Goiter	4.03	3.10	4.70	7.77	1.67	16.61	8.45	2.16	2.86	4.81
Hypertrophic tonsillitis	9.84	4.76	2.11	2.31	4.86	.94	9.92	8.46	5.83	1.91
Arthritis and allied affections	2.38	5.06	1.58	2.79	2.85	5.12	2.37	3.02	4.43	3.59
Asthma	2.07	2.62	1.65	1.98	1.87	2.76	2.12	4.06	2.71	3.10
Other diseases or defects	43.30	35.25	27.48	32.16	26.74	42.52	43.09	92.83	43.90	33.47
All diseases or defects	527.04	399.26	276.01	375.53	312.38	570.18	451.55	819.11	400.98	353.23

Diseases or defects	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming
Orthopedic impairments	105.59	61.79	164.29	174.59	112.34	204.13	92.99	132.20	81.23
Crippled or paralyzed members	46.13	31.06	43.81	53.37	51.69	43.98	41.59	39.02	32.90
Lost members:									
Upper extremities:									
Fingers	4.27	2.46	4.01	9.58	5.01	9.94	4.37	6.96	4.06
Other	1.92	1.91	1.06	3.09	1.78	2.34	1.73	1.41	.83
Lower extremities	4.29	3.51	4.51	5.99	4.59	4.83	5.80	3.16	3.65
Flat feet	22.01	13.52	80.42	55.97	18.64	118.32	12.64	57.39	20.59
Other specified foot defects	19.62	5.08	20.03	35.51	23.63	18.80	20.79	15.62	6.55
Curvature of the spine	7.35	3.35	10.45	10.18	7.00	5.92	6.07	8.64	3.56
Eye defects	47.64	40.87	38.87	82.21	47.69	52.73	47.20	49.17	26.60
Defective vision	31.27	26.48	26.22	67.84	31.60	41.27	30.65	39.98	18.23
Blindness in one or both eyes	10.60	8.90	9.58	9.48	8.73	8.99	7.70	5.11	5.22
Trachoma	1.30	1.83	.25	.10	.68	.47	1.94	.37	.50
Other eye defects	4.47	3.66	2.82	4.79	6.68	2.00	6.91	3.71	2.65
Cardiovascular-renal diseases	44.01	27.32	75.92	72.52	62.88	107.65	33.14	40.14	23.46
Valvular diseases of the heart	25.83	14.35	56.14	41.20	26.73	83.02	16.10	22.31	15.42
Cardiac hypertrophy	3.49	2.19	4.07	3.19	6.72	9.37	2.60	3.88	2.98

TABLE 7.—*Prevalence of defects (per 1,000 total drafted men) noted in men who were rejected or accepted for limited service, by State*—Continued

Diseases or defects	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming
Cardiovascular-renal diseases—Con.									
Tachycardia	4.42	2.86	5.32	7.58	12.53	6.34	4.37	4.91	1.08
Functional heart diseases	2.91	2.29	1.94	1.60	9.42	1.18	5.01	1.62	.83
Other	7.36	5.63	8.45	18.95	7.48	7.74	4.06	7.45	2.15
Underweight	46.12	23.87	21.35	54.57	28.23	20.47	14.66	22.52	11.60
Hernia and inguinal rings	23.17	21.09	28.23	43.59	34.83	28.72	30.19	26.57	22.13
Hernia	21.41	19.30	16.15	32.02	26.70	23.00	22.23	20.26	18.48
Enlarged rings	1.76	1.79	12.08	11.57	8.13	5.72	7.96	6.31	3.65
Tuberculosis (all forms), actual or suspected	29.03	22.07	15.58	29.63	30.63	27.92	17.03	19.58	12.10
Defective and deficient teeth	11.04	5.91	18.71	102.85	21.33	22.91	13.21	16.03	9.28
Nervous or mental diseases	35.41	18.96	15.33	58.45	39.98	18.47	20.59	23.20	10.03
Mental deficiency	21.87	9.26	7.07	32.12	25.14	8.12	12.06	12.10	3.65
Epilepsy	3.64	4.64	2.69	10.47	4.86	3.23	3.21	3.40	1.57
Mental alienation	4.12	2.17	2.63	7.78	3.84	3.63	1.99	3.29	2.74
Other	5.78	2.89	2.94	8.08	6.14	3.49	3.33	4.41	2.07
Ear defects	12.53	10.15	18.09	18.26	11.32	18.95	13.11	13.67	9.53
Defective hearing	7.20	5.81	9.33	11.97	6.65	9.52	5.51	6.83	2.98
Otitis media	4.69	3.80	6.95	4.49	4.06	6.72	6.93	6.26	5.22
Other ear diseases	.64	.54	1.81	1.80	.61	2.71	.67	.58	1.33
Venereal diseases	9.87	5.90	2.94	4.99	10.97	5.60	7.95	4.04	3.48
Gonorrhea	6.35	3.22	1.38	3.59	7.03	3.71	5.73	3.02	1.41
Syphilis	3.09	2.37	1.56	1.40	3.42	1.80	1.96	1.02	2.07
Chancroid	.43	.31	--		.52	.09	.26	--	---
Varicose veins, varicocele	5.61	3.73	6.45	12.77	7.70	8.79	6.67	8.41	2.82
Goiter	4.62	.88	15.40	6.98	8.41	16.57	9.18	16.03	2.32
Hypertrophic tonsillitis	3.28	.61	6.26	15.16	12.14	1.31	7.97	8.99	2.49
Arthritis and allied affections	3.32	2.76	3.13	3.09	6.05	3.11	3.72	3.48	1.66
Asthma	2.22	1.87	1.13	8.68	3.14	2.07	2.14	2.25	.99
Other diseases or defects	15.50	28.51	30.23	67.64	50.36	33.26	37.00	30.97	19.81
All diseases or defects	428.96	276.29	464.91	755.98	488.00	572.66	354.75	417.98	239.53

From earlier discussions in this article, it is apparent that much uncertainty attaches to the question of the number of defects which will be noted, State by State, among persons classified as not available for general military service under the administration of the present conscription law. But, although it is not clear to what extent the findings of the 1917–18 draft in each State will be repeated in the present instance, it is equally clear that there is no other basis on which to make reasonable estimates. National estimates were given at the beginning of the article. If a person desires to make similar estimates by impairments for individual States, he can do so from table 7, providing the number of men to be examined in the given State is known. The procedure would be to multiply this number of men to be examined by the rates for each diagnosis group for that State (dividing by 1,000 to place the calculation on a per person basis).[12]

[12] If it is desired to make the calculation from the quotas of men to be inducted (as, for example, those given in footnote 3), the procedure would be to divide the quota by 1 minus the proportion of men classified as not available for general military service (expressed per person, i. e., figures from table 6 for the given State divided by 100). The quotient is then the estimated number of examinations necessary to produce the quota.

By way of example, the New York quota (footnote 3) is 114,796. Table 6 gives, for that State, 39.5 as the percentage not available for general military service. Hence, the estimated number to be examined would be 114,796 divided by 1 minus 0.395, or 189,620.

SUMMARY

1. In connection with a suggested program of physical rehabilitation of registrants disqualified for general military service under the conscription act of 1940, the medical findings of the World War draft of 1917–18 ("second million") have been summarized.

2. Twenty-one percent were rejected for military service, 31 percent were classified as not available for general military service (including the rejections), and 52 percent had one or more recorded defects.

3. On the basis of the World War draft of 1917–18, one might expect that, to meet the quota of 800,000 inducted men by July 1, 1941, 1,200,000 would have to be examined and thus that about 400,000 would not be available for general military service.

4. On the same basis, the estimated number of defects to be found among these 400,000 persons is given, the most frequently occurring conditions which are largely remediable being defective vision, underweight, tuberculosis, defective and deficient teeth, hernia, and venereal diseases.

5. Again on the same basis, estimated numbers of persons in each State who will be classified as not available for general military service are also given, with the percentages. There is wide variation from State to State in the percentages.

6. Data are presented to permit estimates of the number of defects of different kinds which will be found among persons examined in each State.

APPENDIX

SECTION A

Calculation of percentage of persons placed in each physical status group

As specified in the text, this analysis is confined to "second million" (plus local board) examinations. The method of combining these two sources of information is most easily explained by indicating the precise calculations, as done in table 8.

TABLE 8.—*Calculation of percentage of persons placed in physical status groups*

Item	Line	Number
LOCAL BOARDS		
Number of local board examinations [a]	1	3,764,101
Number of rejections by local boards [a]	2	549,099
Number placed in limited service groups [b] [c]	3	427,813
Number who did not reach camp ("DNRC") [b] [d]	4	299,458
Number who did reach camp ("RC") [b]	5	128,355
Number rejected at camp [b]	6	16,488
Number in "second million" [e]	7	74,242
Estimated distribution at camp:		
General service (with defects) [f]	8	23,241
Limited service [g]	9	41,464
Rejected [h]	10	9,537
Total number rejected or placed in limited service groups [i]	11	976,912
Difference between this number and number examined [j]	12	2,787,189

See footnotes at end of table.

Table 8.—*Calculation of percentage of persons placed in physical status groups*—Continued

Item	Line	Number
CAMPS		
Number of "first million" examinations [a]	13	994, 206
Number of "second million" examinations [a]	14	967, 486
Number from which "second million" was drawn [a]	15	1, 672, 661
Remaining [a] [k]	16	548, 135
Classification of "second million" examinations:		
Total accepted for general service:		
With no defects [a]	17	577, 603
With defects [a]	18	262, 950
Accepted for limited service [a]	19	41, 464
Rejected [a]	20	85, 469
Less "DNRC":		
Accepted for general service:		
With no defects [a]	21	577, 603
With defects [l]	22	239, 709
Accepted for limited service [m]	23	0
Rejected [n]	24	75, 932
Sum [o]	25	893, 244
EXPRESSION IN TERMS OF FULL UNIVERSE OF DISCOURSE		
Rejections:		
Local boards (line 2)	26	549, 099
Camps:		
Except "DNRC" [p]	27	236, 931
"RC" (line 6)	28	16, 488
Total [q]	29	802, 518
Percentage of line 1	30	*21.9*
Placed in limited service groups:		
"DNRC" (line 4)	31	299, 458
"RC" [r]	32	71, 686
Total [s]	33	371, 144
Percentage of line 1	34	*9.9*
Accepted for general service with defects:		
Camp:		
Except "DNRC" [t]	35	747, 964
"RC" [u]	36	40, 181
Total [v]	37	788, 145
Percentage of line 1	38	*20.9*

[a] From "Defects Found in Drafted Men," op. cit.

[b] From Provost Marshal General's Second Report, op. cit.

[c] The "remediable" group has been combined with the "limited service" group, since men were transferred from the former to the latter before being sent to camp. Only a nominal number of persons were placed in the "remediable" group at the camps.

[d] "DNRC" is used in this explanation for the group of persons who were placed in limited service groups by local boards, but who did not reach camp (by Sept. 11, 1918), "RC" is used for those so classified who did reach camp.

[e] Line 5 times $\frac{\text{line 14}}{\text{line 15}}$. Only a few persons from limited service groups reached camp soon enough to be included in the "first million"; hence, the estimated number to be found in the "second million" depends on the proportion which the "second million" was of the sample from which it was drawn.

[f] Line 7 minus the sum of lines 9 and 10.

[g] From line 19. All persons classified at camp as limited service are assumed to have been so classified by local boards.

[h] Line 6 times $\frac{\text{line 14}}{\text{line 15}}$. See note (e).

[i] Line 2 plus line 3.

[j] Line 1 minus line 11.

[k] Includes line 4.

[l] Line 18 minus line 8.

[m] Entire group classified as having been placed in limited service group by local boards ("RC"). See line 9.

[n] Line 20 minus line 10.

[o] Sum of lines 21-24.

[p] Line 24 times $\frac{\text{line 12}}{\text{line 25}}$.

[q] Sum of lines 26-28.

[r] Line 9 times $\frac{\text{line 15}}{\text{line 14}}$.

[s] Sum of lines 31 and 32.

[t] Line 22 times $\frac{\text{line 12}}{\text{line 25}}$.

[u] Line 8 times $\frac{\text{line 15}}{\text{line 14}}$.

[v] Sum of lines 35 and 36.

By way of explanation, it should be stated that examination records of persons placed in limited service groups by local boards were not available for the analyses covered in the report, "Defects Found in Drafted Men." Of this group, those who later reached camp were reexamined there and their records are included, if they were in the "second million"; however, only part of the limited service group ever got to camp. Those who did, did not do so early enough to be included, in any numbers, in the "first million." Hence, they form a disproportionate part of the "second million" and require a factor to "step up" the records to the full universe of discourse (i. e., local board examinations).

SECTION B

Calculation of the prevalence of specific defects (per 1,000 total drafted men) noted in men who were placed in each physical status group

Calculations of the rates of defects followed the methods described in section A, the number of cases found at camp for any one defect being "stepped up" to the full universe of discourse just as the persons among whom these cases occurred had been "stepped up."

In view of the fact, however, that no information as to diagnosis was available for men who had been placed in limited service groups by local boards, a further assumption was necessary. It was that the relative distribution of different impairments in the limited service groups as found at camp could be taken to represent the relative distribution at the local boards.

The complete calculation is shown in table 9 for one defect (hernia).

TABLE 9.—*Calculation of rates of hernia (per 1,000 drafted men) among persons classified by physical status. (Hernia used as an example of the procedure)*

Item	Line	Number
LOCAL BOARDS		
Number of local board examinations [b]	1	3,764,101
Number of cases found among rejected men [c]	2	21,275
Number of persons classified as "DNRC" [b, d]	3	290,458
CAMPS		
Number of cases found:		
Among rejected men [c]	4	11,076
Among men placed in limited service groups *at camp* [c]	5	2,768
Among men accepted for general service [c]	6	8,284
EXPRESSION IN TERMS OF FULL UNIVERSE OF DISCOURSE		
Among rejected men:		
Local boards (line 2)	7	21,275
Camps [e]	8	32,841
Sum of lines 7 and 8	9	54,116
Rate (per 1,000 drafted men)	10	14.38

See footnotes at end of table.

TABLE 9.—*Calculation of rates of hernia (per 1,000 drafted men) among persons classified by physical status. (Hernia used as an example of the procedure)*—Con.

Item	Line	Number
EXPRESSION IN TERMS OF FULL UNIVERSE OF DISCOURSE—continued		
Among men placed in limited service groups [f]	11	24,776
Rate (per 1,000 drafted men)	12	*6 58*
Among men accepted for general service [g]	13	24,830
Rate (per 1,000 drafted men)	14	*6.60*

[a] From "Defects Found in Drafted Men," op. cit.
[b] From Provost Marshal General's Second Report, op cit.
[c] From table 8, line 1.
[d] From table 8, line 4. See note (d) of that table for definition of symbols "DNRC" and "RC."
[e] Line 4 times 2 9651. This factor, applicable to each diagnosis, equals the following (from table 8):

$$\left(\frac{\text{line 24}}{\text{line 20}}\times\frac{\text{line 12}}{\text{line 25}}\right)+\left(\frac{\text{line 10}}{\text{line 20}}\times\frac{\text{line 15}}{\text{line 14}}\right)$$

[f] Line 5 times 8 9510 This factor, applicable to each diagnosis, covers the "DNRC" group and also persons classified as available for limited service at camp It is equal to the following (from table 8):

$$\frac{\text{line 4}}{\text{line 9}}+\frac{\text{line 15}}{\text{line 14}}$$

[g] Line 6 times 2 9973 This factor, applicable to each diagnosis, equals the following from table 8:

$$\left(\frac{\text{line 22}}{\text{line 18}}\times\frac{\text{line 12}}{\text{line 25}}\right)+\left(\frac{\text{line 8}}{\text{line 18}}\times\frac{\text{line 15}}{\text{line 14}}\right)$$

SECTION C

Calculations by States

Since, for each State, information was not available as to the proportion who reached camp out of those who were placed in limited service groups by local boards, the national proportions were necessarily used in arriving at the percentage of persons placed in the different physical status groups in each State (table 6.)[13]

[13] The value, for any State, corresponding to that given on line 28 of table 8 was obtained by multiplying the number placed in limited service groups by local boards in the given State by $\frac{16,488}{427,813}$.

The value, for any State, corresponding to that given on line 27 of table 8 was obtained by (*a*) multiplying the above product by $\frac{967,486}{1,672,661}$, (*b*) subtracting the result from the number rejected at camp for the given State, and finally (*c*) multiplying the difference by a separate factor for each State This factor has for its numerator the value, for the given State, corresponding to line 12 of table 8, and for its denominator the difference between (1) the number examined at camp ("second million") in the given State and (2) the number placed in limited service groups by local boards times $\frac{128,355}{427,813}$ times $\frac{967,486}{1,672,661}$.

The value, for any State, corresponding to that given on line 31 of table 8 was obtained by multiplying the number who were placed in limited service groups by local boards in each State by $\frac{299,458}{427,813}$.

The value, for any State, corresponding to that given on line 32 of table 8 was obtained by multiplying the number placed in limited service groups at camp in the given State by $\frac{1,672,661}{967,486}$.

The value, for any State, corresponding to that given on line 36 of table 8 was obtained by subtracting the calculated value corresponding to line 32 from the product of (*a*) the number of persons placed inlimited service groups by local boards in the given State and (*b*) the factor $\frac{111,867}{427,813}\left(\text{i. e., }\frac{128,355-16,488}{427,813}\right)$.

The value, for any State, corresponding to that given on line 35 of table 8 was obtained by (*a*) multiplying the calculated value corresponding to line 36 by $\frac{967,486}{1,672,661}$, (*b*) subtracting the product from the number of persons found at camp to be available for general military service, with defects, and (*c*) finally multiplying this difference by the factor mentioned in connection with the calculation for line 27.

In the calculation of table 7, the factor given in footnote e of table 9 was used without change, as a convenient approximation. However, the factor given in footnote f of table 9 was modified by substituting, for the first term, the product of (*a*) $\frac{299,458}{427,813}$ and (*b*) the quotient obtained by dividing the number of men placed in limited service groups *by local boards* in the given State by the number placed in limited service groups *at camp* for the given State.

REPORT OF A NEW TYPE OF PNEUMOCOCCUS WHICH CROSSES WITH TYPES X, XI, XX, XXIX, AND XXXI ANTIPNEUMOCOCCIC SERUMS[1]

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During the pneumococcus type incidence survey conducted recently in northern California by the United States Public Health Service in cooperation with the California State Department of Public Health, it was observed that certain pneumococci reacted with more than one type-specific serum. In this survey, which covered 23 counties in northern California, one or more specimens of sputum, other biological fluids, or cultures, from 1,096 patients were examined at the State public health laboratory at Berkeley to determine the presence of significant organisms, and to type pneumococci whenever these were present. Most of the patients were proved cases of pneumonia. Specimens from 255 cases were sent to the State laboratory for a primary diagnosis. The specimens from 841 cases had already been examined by a hospital or private clinical laboratory and were brought to the State laboratory by messenger for checking or further study. This phase of the survey covered the period from January 20, 1939, to April 30, 1940.

The method used for examining the sputums, other biological fluids, or cultures, was as follows: The specimen was examined by the Neufeld method to determine the presence and type of pneumococcus. If no swollen capsules were observed the material was injected intraperitoneally into a white mouse and/or a blood agar plate was streaked, or dextrose blood broth or dextrose ascites broth was inoculated with the material being tested.

The technique of the Neufeld test was that described by Walter (*5*). A small (1 mm.) loopful of the specimen was placed on a flat glass slide and a large (4 mm.) loopful of serum and a large loopful of Loeffler's methylene blue were mixed with it. A coverslip was

[1] From the Division of Laboratories, California State Department of Public Health, and the Divisions of Public Health Methods and Biologics Control, National Institute of Health.

placed over the mixture at once. The preparation was examined under the oil immersion lens with a strong light partially dimmed.

All specimens were tested with each of the diagnostic group serum mixtures, and then with each specific type serum included in any group mixture which caused capsular swelling or agglutination of the pneumococci. In the case of specimens in which specific types had been reported by the hospital or private laboratory which submitted the specimen, if the group serum mixture containing a reported type caused no capsular swelling or agglutination, the organism was tested with the specific serum of the type reported.

The mice were inoculated intraperitoneally with 0.25 cc. to 0.5 cc. of sputum or culture. If the mice survived 12 to 24 hours after inoculation, but were moribund, they were killed. Otherwise, they were allowed to live for 5 or 6 days before they were sacrificed. From a few such mice which had never shown signs of illness, positive brain and heart blood cultures were obtained. Peritoneal punctures were not routinely made.

Following the death of a mouse, Neufeld tests were performed on the peritoneal fluid, and cultures were made from the peritoneal fluid, heart blood, and brain. The peritoneal fluid was streaked over a blood agar plate and the heart blood and brain were cultured in broth enriched with either blood or ascites fluid. If growth was obtained, the cultures were tested by the Neufeld method.

The media were prepared according to the methods described by Walter (*5*). Horse blood was used for the blood agar plates. A 20-percent solution of dextrose was added to the broth in amounts sufficient to make 0.5 percent. Either horse blood or ascites fluid was used for further enrichment. These seemed equally effective.

The first multiple reaction observed was one in which the organisms exhibited swollen capsules with both type XX and type XXIX serums. This reaction was obtained both by a Neufeld test performed directly on the sputum and with organisms obtained from a blood agar plate which had been streaked with the sputum.

Later, other specimens were encountered which reacted with two or more of the diagnostic antipneumococcic serums, types X, XX, XXIX, and XXXI. In every case the possibility of the mixture of these types was excluded. Only one specimen was recorded as reacting with types X, XI, XX, XXIX, and XXXI. At the time, this specimen was believed to contain a type XI pneumococcus in addition to the multiple reacting pneumococcus.

Most of the multiple reacting pneumococci were noted in direct examination of sputum. During the last 2 months of the survey, whenever reactions with one of the types X, XX, XXIX, or XXXI serums occurred, each specimen in which one of these types was found was also examined for the remaining three types. The number

of specimens containing pneumococci which reacted with these types is given in table 1.

TABLE 1.—*Cases from which were obtained specimens*[1] *containing pneumococci which reacted with more than 1 type-specific serum*

Types found[2]	Number of cases	Types found[2]	Number of cases
X, XXIX	6	X, XX, XXXI	4
XX, XXIX	4	X, XX, XXIX, XXXI	7
XX, XXXI	8	X, XI, XX, XXIX, XXXI	1
XXIX, XXXI	1		
X, XX, XXIX	7	Total	33

[1] The 33 original specimens, obtained from the same number of cases, consisted of 29 sputums, 2 throat cultures, 1 lung puncture fluid, and 1 blood culture.
[2] In 28 of the 33 cases these types were found in the original specimen by the Neufeld technique. In the remaining 5 cases the pneumococci were demonstrated only by mouse inoculation or in broth culture or both.

The 4 types were also found singly in specimens. Type X alone was present in 12 specimens, type XX in 23, type XXIX in 7, and type XXXI in 14. In addition, one of these 4 types was found in combination with one or more other types in 20 specimens.

The incidence of these types and the multiple reacting type which we have listed as "odd" is given in table 2. It will be noted that the incidence of the multiple reacting pneumococci (4.2 percent of all types and 4.9 percent of the higher types) exceeds any one of the four types in the survey in California.

TABLE 2.—*Incidence of the multiple reacting pneumococci and 4 types with which they crossed*

	Number	Percent of all types	Percent of higher types
Total number of cases from which specimens were examined	1,096		
Number of cases from which specimens were positive for pneumococci	789		
Number of cases from which specimens contained only higher types of pneumococci	675	85.6	
Number of cases from which specimens contained only:			
Type X pneumococci	12	1.5	1.8
Type XX pneumococci	23	2.9	3.4
Type XXIX pneumococci	7	.9	1.0
Type XXXI pneumococci	14	1.8	2.1
Types X, XX, XXIX, or XXXI, plus other types	20	2.5	3.0
"Odd"	33	4.2	4.9

Table 3 gives the form of illness of patients harboring the multiple reacting pneumococci, the outcome of their illness, and the results of the original laboratory examinations.

TABLE 3.—*Summary of cases in which multiple reacting pneumococci were found*

Case No.	Race	Sex	Age	Diagnosis	Complications	Outcome	Specimen	Date specimen received	Types found by[1]— Direct test	Mouse inoculation	Broth culture
								1939			
1	W	M	65	Bronchopneumonia		Recovered	Sputum	Jan. 26	XXIX, XX	Not done	Not done.
2	W	F	6	Bronchopneumonia (post measles).	Mastoiditis, bilat.	do	Throat culture	Feb. 9	XXIX, XX	do	Do.
3	W	M	70	Bronchopneumonia	Cerebral hemorrhage.	Died	Lung puncture fluid.	Feb. 18	XXIX, XX	do	Do.
4	W	F	39	do		Recovered	Sputum	Feb. 27	XVIII, X-XX-XXIX	do	Do.
5	W	M	68	do	Fracture of femur	do	do	Mar. 29	III, XX-XXXI	do	Do.
6	W	M	69	do	Chronic alcoholism	do	do	Apr. 17	XIX, XX-XXXI	do	Do.
7	W	M	73	do	Lung abscess	do	do	Apr. 18	XX, X-XXXI	do	Do.
8	W	M	50	Lobar pneumonia		do	do	June 2	XXIV, XXIX-X	XXIV-X-XXIX	None.
9	W	F	29	Bronchopneumonia		do	do	July 25	XX, X-XXIX-XXXI-XI.	Not done	XXIX, X-XX-XXXI-XI.
10	W	M	45	Lobar pneumonia	Empyema	do	do	Aug. 2	None	X-XXIX	XXIX, X.
11	W	M	35	Pneumonia		do	do	Aug. 4	XXIX, X-XX	XXIX, X-XX	XXIX, X-XX.
12	W	M	45	Lobar pneumonia		do	do	Aug. 20	None	X, XX-XXIX	None.
13	W	M	61	Bronchopneumonia		do	do	Aug. 31	X-XXIX	Not done	Do.
14	W	F	26	Lobar pneumonia		do	do	Oct. 20	X, XX-XXIX	None	Do.
15	W	M	67	do		do	do	Oct. 23	X, XXIX	Not done	X-XXIX.
16	W	M	40	Bronchopneumonia	Ruptured spleen	Died	do	Oct. 30	X, XX-XXXI	do	XX, X-XXIX-XXXI.
17	W	M	43	Lobar pneumonia		do	Blood culture	Dec. 13	XXIX, XX	do	Not done.
18	W	M	61	Bronchopneumonia		Recovered	Sputum	Dec. 19	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI.
19	W	M	36	Lobar pneumonia		do	do	Dec. 23	X-XX-XXXI	Not done	X-XX-XXXI.
20	W	F	53	Bronchopneumonia		do	do	Dec. 27	X-XX-XXXI	do	X-XX-XXXI.
								1940			
21	W	M	38	Lobar pneumonia		do	do	Jan. 6	XXIX, X-XX	do	XXIX, X-XX.
22	W	M	23	Hypostatic pneumonia.	Fractured vertebra	Died	do	Jan. 16	None	X-XXIX	Not done.
23	W	M	43	Pneumonia		Recovered	do	Jan. 18	X-XX-XXXI	Not done	X-XX-XXXI.
24	W	F	16	Lobar pneumonia		do	do	do	XXXI	do	XXIX-XXXI.
25	W	M	60	Bronchopneumonia		do	do	Jan. 25	XXIX, X-XX-XXXI	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI.
26	W	M	45	Lobar pneumonia		do	do	Jan. 29	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI.
27	W	M	51	Bronchopneumonia		do	do	Mar 2	X-XX-XXIX	X-XXIX	X-XXIX.
28	W	F	69	do		do	do	Mar. 8	XXIX, X	X-XXIX	X-XXIX.
29	W	M	1	Lobar pneumonia	Otitis media	do	Throat culture	Mar 14	XX-XXXI	XX-XXXI	Not done.
30	W	F	34	Bronchopneumonia		do	Sputum	Mar 15	None	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI.
31	W	F	58	Lobar pneumonia		do	do	Mar. 18	X	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI.
32	W	F	36	Post-pneumonic tbc. (?).		do	(See text)	Mar. 22	None	X-XX-XXIX-XXXI	X-XX-XXIX-XXXI.
33	W	M	50	Bronchopneumonia		do	Sputum	Apr 30	XXIX	XXIX, X-XX	XXIX, X-XX.

[1] Whenever any one type was designated as predominating it is placed first and separated from the others by a comma. When no type seemed to predominate, the types are separated by a dash.

In cases Nos. 1 to 7, inclusive, the findings were confirmed by blood agar plates.
The recorded findings for each of cases Nos. 16 and 25 are the composite of the findings in two specimens.

A careful study of these pneumococci was not undertaken until late in the pneumococcus type survey. The first strains of multiple reacting pneumococci had not been kept. However, 2 strains of these pneumococci were isolated from the throats of 2 convalescent patients who had previously harbored pneumococci reacting with 4 type-specific serums, and 4 similar strains were isolated from new cases. A study of 5 of these strains forms the basis for our conclusions that the 5 strains are identical and that they represent a distinct type of pneumococcus which differs from all of the 32 recognized types but which gives cross reactions with types X, XI, XX, XXIX, and XXXI serums. One of the 6 strains which had been preserved in a dry state while immunization experiments were being carried on failed to grow when needed.

HISTORY OF THE 6 STRAINS

Strain 18 was isolated from the throat of a white male patient, aged 61 years, who was convalescing from an attack of bronchopneumonia. At the time of the acute illness, in December 1939, a positive Neufeld reaction had been observed on examination of the sputum with serums of types X, XX, XXIX, and XXXI, and pneumococci which reacted with serums of these 4 types had been isolated from the sputum. No pneumococci were seen in a direct examination of a throat swab made 10 weeks later from the convalescing patient. Pneumococci, however, grew in a dextrose broth culture made from the throat swab. These pneumococci exhibited swollen capsules with type XXXI serum. After passage through a mouse, they reacted with types X, XX, and XXIX serums as well as with serum of type XXXI.

Strain 25 was isolated from the throat culture of a white male patient, aged 60 years, 6 weeks after recovering from bronchopneumonia. Pneumococci had been found reacting to serums of types X, XX, XXIX, and XXXI in a Neufeld test on sputum obtained at the time of the acute illness in January 1940, and also in a dextrose broth culture of the sputum. This culture had not been saved. The throat culture was made in dextrose ascites broth. After 4 hours incubation, 2 mice were each inoculated with the culture. Pneumococci were not seen in the culture itself or on a blood agar plate streaked with the culture. The mice died, however, 24 hours after inoculation. An organism which was bile-soluble and which agglutinated with types X, XX, XXIX, and XXXI was isolated from each of the mice. Two mice were then inoculated with these cultures but they did not succumb. A subculture was made from one of the cultures obtained from the dead mice and mice inoculated with this culture died after 24 hours. The pneumococci isolated from these

mice and from subsequent mice through which the culture was passed reacted in different ways with the four type-specific serums. For example, some of the reactions were as follows: Swollen capsules with serums of types X, XXIX, and XXXI, and partially swollen capsules with type XX serum; swollen capsules with types X and XXIX, and agglutination with types XX and XXXI; swollen capsules with types X and XXIX, partially swollen capsules with type XXXI, and agglutination with type XX.

Strain 26 was recovered in January 1940 from sputum from a case of lobar pneumonia. The patient was a white man, aged 45. In a Neufeld test performed on the sputum, capsular swelling was produced by serums of types X, XX, XXIX, and XXXI. A mouse inoculated with the sputum did not succumb until the tenth day. Pneumococci were isolated from this mouse which at one time or another reacted with all 4 type-specific serums, types X, XX, XXIX, and XXXI.

Strain 30 was recovered from the sputum of a white woman, aged 34 years, who had bronchopneumonia. A Neufeld test performed on the sputum, which was obtained on the sixth day of illness, did not reveal the presence of a pneumococcus. However, a dextrose broth culture made from the sputum contained a pneumococcus whose capsules were swollen by serums of types X and XX. After one mouse passage, agglutination or capsular swelling was observed with serums of types X, XX, XXIX, and XXXI.

Strain 31 was from a case of lobar pneumonia in a white woman, aged 58. A Neufeld test performed on the sputum obtained on the third day of illness showed the presence of a pneumococcus with partially swollen capsules with type X serum. A dextrose broth culture made from the sputum and cultures from mice which had been inoculated with the sputum contained pneumococci which reacted with all four types of serum.

Strain 32 was isolated from fluid obtained from a draining sinus from the right lung of a white woman, aged 36, who was suspected of having tuberculosis. The patient had bronchopneumonia 5 years previously, following which she developed symptoms of tuberculosis. Many specimens of drainage fluid and sputum had been examined for tubercle bacilli at the State laboratories, but all were negative. One specimen contained a gram-positive diplococcus which proved to be a multiple reacting pneumococcus. This strain of pneumococcus, at the time the cultures were received at the National Institute of Health, appeared to have a slightly better capsule than any of the other five strains. For this reason it was chosen as the strain for producing immune serum in rabbits. After a few mouse passages, no differences in the size of the capsules of the different strains could be detected.

Virulence.—All of the six cultures were virulent for mice at the time of isolation, and, as a rule, the mice were dead 24 hours after inoculation. Exact tests for virulence were carried out on strains 18, 25, 30, 31, and 32 several months after the original isolations and after a number of mouse passages. These strains were highly virulent, as few as one pneumococcus being necessary to kill. As an example, the virulence test of strain 32 is given in table 4.

TABLE 4.—*Virulence test of pneumococcus strain 32*

Dose of pneumococci	Number of pneumococci per 1 cc. of culture dilution (determined by duplicate blood agar plates)	Death of mice, number of hours after inoculation	Dose of pneumococci	Number of pneumococci per 1 cc. of culture dilution (determined by duplicate blood agar plates)	Death of mice, number of hours after inoculation
1 cc. of 10^{-1}		19 19	1 cc. of 10^{-6}	220 270	19 30
1 cc. of 10^{-2}		19 26	1 cc. of 10^{-7}	23 27	45 45
1 cc of 10^{-3}		26 45	1 cc of 10^{-8}	2 3	32 45
1 cc. of 10^{-4}		32 45	1 cc. of 10^{-9}	0 0	45 [1]
1 cc of 10^{-5}		26 26			

[1] Survived.

The first questions to be answered regarding these multiple reacting pneumococci were: Are the strains immunologically identical? And do they belong to one of the four recognized types of pneumococci, types X, XX, XXIX, or XXXI, and only cross with the remaining three types?

For comparative purposes the test used at the National Institute of Health (*4*) for determining the potency of pneumococcus typing serums was used. It has been shown by one of us (B. E. E.) (*1*) that if the antigens are carefully prepared and standardized the results of these tests can be duplicated with reasonable accuracy. Tests were performed using antigens prepared from the homologous type pneumococci and from six strains of the multiple reacting pneumococci on diagnostic type-specific serums and upon concentrated rabbit serums prepared for therapeutic use by different commercial laboratories. The results are given in table 5. It will be observed that all six multiple reacting strains behaved in an identical fashion and that the extent of the cross reaction of the different commercial serums with the multiple reacting pneumococci depended largely upon the potency of the serum. There were exceptions, however, and these exceptions cannot at present be satisfactorily explained. They might be due to some difference in the type strain used for immunization or to some other variation of method of preparing the serum.

Table 5.—*Quantitative Neufeld tests performed on commercial diagnostic and therapeutic antipneumococcic serums to determine the extent of the cross reactions*

Antipneumococcic rabbit serums	Lot	Capsular swelling titers for— Homologous type pneumococcus	Strain 32	Strain 18	Strain 25	Strain 26	Strain 30	Strain 31
Type X, diagnostic	D101	1:16+	<1:2					
	D102	1:16+	<1:2					
	D103	1:16	<1:2					
	D104	1:8	0					
	D105	1:16+	Agg.					
	D106	1:16	<1:2					
	D107	1:32+	<1:2					
	D108	1:8+	Agg.					
	D109	1:8+	Agg.					
	D110	1:16	0					
	D111	1:32	0					
Type X, therapeutic	T101	1:128	1:4	1:4	1:4	1:4	1:4	1:4
	T102	1:128	1:4+	1:4+	1:4+	1:4+	1:4+	1:4+
	T103	1:32	1:2+					
	T104	1:32	<1:4					
	T105	1:16+	<1:4					
Type XI, diagnostic	D201	1:32+	Agg.			Agg.		
	D202	1:16+	Partial agg.					
	D203	1:8	do.					
	D204	1:16	0			0		0
	D205	1:16	0			0		0
	D206	1:16	Partial agg.			0		0
	D207	1:8	Do.					
	D208	1:16	Do.					
	D209	1:16	0					
	D210	1:16	Partial agg.					
	D211	1:32+	Agg.			Agg.		
	D212	1:64	0					
	D213	1:16	Partial agg.					
	D214	1:8+	Do.					
	D215	1:8+	0					
	D216	1:32+	Partial agg.					
Type XI, therapeutic	T201	1:128	Agg.					
	T202	1:128	<1:4					
	T203	1:128	<1:4	<1:4	<1:4	<1:4	<1:4	<1:4
	T204	1:32+	Agg.					
	T205	1:16+	0					
Type XX, diagnostic	D301	1:16	Agg.					
	D302	1:8+	0					
	D303	1:16	0					
	D304	1:32	<1:2					
	D305	1:16+	Agg.					
	D306	1:32+	<1:2					
	D307	1:8+	Agg.					
	D308	1:16	0					
	D309	1:16	0					
Type XX, therapeutic	T301	1:128	<1:4	<1:4	<1:4	<1:4	<1:4	<1:4
	T302	1:128+	1:2					
	T303	1:128	<1:4					
	T304	1:32+	<1:4					
	T305	1:16+	0					
Type XXIX, diagnostic	D401	1:16+	1:2					
	D402	1:16+	1:2					
	D403	1:16+	1:2					
	D404	1:16	<1:2					
	D405	1:8+	<1:2					
	D406	1:16	<1:2					
	D407	1:16+	<1:2					
	D408	1:32	1:2					
	D409	1:32	<1:2					
	D410	1:32+	1:2					
	D411	1:16	<1:2					
	D412	1:8+	<1:2					
	D413	1:16+	<1:2					
Type XXIX, therapeutic	T401	1:128+	1:8					
	T402	1:128+	1:8	1:8	1:8	1:8	1:8	1:8
	T403	1:64	1:2+					
	T404	1:32+	1:2+					
	T405	1:32+	1:2+					

TABLE 5.—*Quantitative Neufeld tests performed on commercial diagnostic and therapeutic antipneumococcic serums to determine the extent of the cross reactions*—Continued.

Antipneumococcic rabbit serums	Lot	Capsular swelling titers for—						
		Homologous type pneumococcus	Strain 32	Strain 18	Strain 25	Strain 26	Strain 30	Strain 31
Type XXXI, diagnostic	D501	1:16+	Agg.					
	D502	1:16+	Do.					
	D503	1:8+	Do.					
	D504	1:16	0					
	D505	1:8	0					
	D506	1:8	0					
	D507	1:16	0					
	D508	1:16	0					
	D509	1.8+	Partial agg.					
	D510	1:32	Agg.					
	D511	1.8+	0					
	D512	1·8+	0					
	D513	1:16+	0					
Type XXXI, therapeutic	T501	1:128	<1:4	<1:4	<1:4	<1:4	<1:4	<1:4
	T502	1:128	<1:4					
	T503	1:32	<1:4					

Agg.=Agglutination, no capsular swelling. 0=No capsular swelling or agglutination.

It is to be remembered that the results given in table 5 are quantitative Neufeld tests. The antigens were diluted to match as exactly as possible a turbidity standard containing 200 parts per million of silica. To 0.1 cc. of the standardized antigen not more than 0.1 cc. of serum was added. This fact, while it made comparisons of the extent of the cross reactions possible, may account for the failure of some of the diagnostic serums to react with the "odd" type, or to react with agglutination rather than capsular swelling. In the routine Neufeld test, more serum than culture is usually employed (*5*).

The number of lots of commercial diagnostic serums examined and the number which reacted with the "odd" type are given in table 6. It will be observed that type XXIX and type X serums most frequently crossed with the "odd" type, followed in order by serums of types XX, XXXI, and XI.

TABLE 6.—*A summary of the results of tests of commercial diagnostic serums*

Types of diagnostic antipneumococcic serums	Number of serums tested	Number of serums causing capsular swelling or complete agglutination of pneumococci of the "odd" type
X	11	8
XI	16	2
XX	9	5
XXIX	13	13
XXXI	13	8

That the cross was greatest with types XXIX and X was again brought out when concentrated rabbit serums for therapeutic use were tested. The strongest type XXIX and type X serums gave titers of 1:8 and 1:4+, respectively, with the "odd" type. The strongest type XX, type XXXI, and type XI serums caused capsular swelling of the "odd" type but the titer for each serum was less than 1:4.

The relationship between the "odd" type and types X and XXIX, and possibly type XX, was again noted during the course of immunization of rabbits with the multiple reacting strain 32. (See table 7.) Serum obtained from the first preliminary bleeding had a capsular swelling titer of 1:2+ with strain 32, but caused no capsular swelling or agglutination of pneumococci of types X, XI, XX, XXIX, or XXXI. The serum from the second preliminary bleeding gave a titer of 1:8+ with the homologous strain and caused complete agglutination of type X pneumococci and partial agglutination of type XXIX pneumococci. The serum from the third bleeding gave a 1:16+ titer for strain 32 and caused complete agglutination of types X and XXIX pneumococci and partial agglutination of type XX pneumococci. As yet, the maximum titer of the serum of the rabbits under immunization remains 1:16+, and no capsular swelling of pneumococci of types X, XI, XX, XXIX, or XXXI has occurred.

TABLE 7.—*Results of tests for cross reactions on serums of rabbits in the process of immunization with pneumococcus strain 32*

Date of bleedings	Capsular swelling titer with homologous strain	Tests for cross reactions with pneumococci—				
		Type X	Type XI	Type XX	Type XXIX	Type XXXI
Aug. 14, 1940	1:2+	0		0	0	0
Aug. 26, 1940	1:8+	Agg.	0	0	Partial agg.	0
Sept. 26, 1940	1:16+	Agg.	0	Partial agg.	Agg.	0

0= No agglutination or capsular swelling.
Agg =Agglutination, no capsular swelling

It may be noted in table 5 that there was a great discrepancy between the capsular swelling titers of the different commercial serums for the respective homologous types of pneumococci and for the multiple reacting strain or strains. This would suggest that the multiple reacting strains were not closely related to the five recognized types. To determine this point, cross absorption tests were made. Strong concentrated rabbit serums of each of the five types, X, XI, XX, XXIX, and XXXI, were absorbed with pneumococci of one of the multiple reacting strains, strain 32, and antipneumococcic rabbit serum for strain 32 was absorbed with pneumococci types X, XX, and XXIX. The results are given in table 8. The titer of each of the

absorbed serums remained the same for the homologous type pneumococcus. Absorption of the commercial serums with strain 32 not only removed the antibody for this strain but for the multiple reacting strains 18, 25, 30, and 31 as well. An antipneumococcic rabbit serum for strain 32 was free of agglutinins for types X, XX, and XXIX after absorption.

TABLE 8.—*Assay of antipneumococcic rabbit serums by the quantitative Neufeld method before and after absorption*

Antipneumococcic rabbit serum	Capsular swelling titers									
	For types					For "odd" strains				
	X	XI	XX	XXIX	XXXI	18	25	30	31	32
Type X, concentrated, Lot T101:										
Before absorption with strain 32	1:128					1:4+	1:4+	1:4+	1:4+	1:4+
After absorption with strain 32	1:128					0	0	0	0	0
Type XI, concentrated, Lot T213										
Before absorption with strain 32		1:128				<1:4	<1:4	<1:4	<1:4	<1:4
After absorption with strain 32		1:128				0	0	0	0	0
Type XX, concentrated, Lot T301:										
Before absorption with strain 32			1:128			<1:4	<1:4	<1:4	<1:4	<1:4
After absorption with strain 32			1:128			0	0	0	0	0
Type XXIX, concentrated, Lot T401:										
Before absorption with strain 32				1:128+		1:8	1:8	1:8	1:8	1:8
After absorption with strain 32				1:128+		0	0	0	0	0
Type XXXI, concentrated, Lot T501										
Before absorption with strain 32					1:128	<1:4	<1:4	<1:4	<1:4	<1:4
After absorption with strain 32					1:128	0	0	0	0	0
Serum 32 not concentrated										
Before absorption with types X, XX, XXIX	Agg.	0	Partial agg.	Agg.	0	1:16+	1:16+	1:16+	1:16+	1:16+
After absorption with types X, XX, XXIX	0		0	0	0	--------	--------	--------	--------	1:16+

0=No capsular swelling or agglutination.
Agg.=Agglutination, no capsular swelling.

DISCUSSION

This new type of pneumococcus is of interest from two standpoints. Its prevalence in the type incidence survey in California is greater than that of either types X, XX, XXIX, or XXXI, and its cross reactions with four and sometimes five of the present recognized types of serum increase the task of preparing specific pneumococcus typing serums.

It is interesting to compare the percentage of multiple reacting strains of pneumococci, 4.9 percent of the higher types in the California survey, with the figures given by Heffron (*3*) for types of pneumococci in and around Boston. The incidence of 20 of the recognized higher types of pneumococci among 2,961 strains in the Boston series was less than 4.9 percent each. The incidence for types X, XX, XXIX, and XXXI was 3.0, 3.1, 2.1, and 1.3 percent, respectively.

Whether the incidence of this new type is as great in other parts of the country as it was in California is as yet unknown. While work on these multiple reacting pneumococci was in progress, a report of four strains of pneumococci which reacted with maximal capsular swelling and agglutination with type XXIX serum and partial capsular swelling or agglutination with one or more of the serums of types X, XX, or XXXI, was made by Foster and Shaughnessy (*2*) in Illinois. No evidence was given to show that these strains do not belong to type XXIX. It is possible, however, that they are identical with our "odd" type.

Every lot of pneumococcus typing serum on the market is tested for cross reactions with all of the recognized heterologous types of pneumococci. In spite of this vigilance it is now evident that confusion with types X, XX, XXIX, XXXI and possibly type XI may occur when this new type is encountered.

Inasmuch as the reactions of the multiple reacting pneumococci with serums of types X, XI, XX, XXIX, and XXXI are only cross reactions and that the Neufeld reaction represents a quantitative combination of antigen and antibody (*1*) and thus varies with differences in the number of pneumococci as well as differences in the potency of the serums, it is not unusual that in different cultures, under different circumstances, the pneumococci sometimes showed capsular swelling, at other times only agglutination, and at still others no reaction of any kind. This variation in the reactions with the different specific serums as 6 of the multiple reacting strains were isolated and first passed through mice is given in table 9. Although the variation was great it is interesting to note that more positives were obtained with serums of types X and XXIX than with serums of types XXXI and XX. Of the total Neufeld tests performed on the cultures or biological fluids, the preparations which contained pneumococci with completely swollen capsules were, respectively, 48 for type XXIX, 42 for type X, 24 for type XXXI, and 6 for type XX. This is, again, in line with the results of quantitative tests which showed that the greatest cross reactions were with types XXIX and X.

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TABLE 9.—*Variation of Neufeld tests for the determination of types during the isolation and first mouse passage of 6 strains of multiple reacting pneumococci*

	Strain 18 tested with serums				Strain 25 tested with serums				Strain 26 tested with serums				Strain 30 tested with serums				Strain 31 tested with serums				Strain 32 tested with serums			
	Type X	Type XX	Type XXIX	Type XXXI	Type X	Type XX	Type XXIX	Type XXXI	Type X	Type XX	Type XXIX	Type XXXI	Type X	Type XX	Type XXIX	Type XXXI	Type X	Type XX	Type XXIX	Type XXXI	Type X	Type XX	Type XXIX	Type XXXI
Direct test of specimen	0	0	0	0	0	0	0	0	+	+	+	+	0	0	0	0	±	0	0	0	0	0	0	0
Dextrose broth culture	0	0	0	+	0	0	0	0	+	+	+	+	+	+	0	0	+	agg.	+	±	+	agg.	+	+
First mouse passage.																								
Mouse A:																								
Peritoneal exudate	0	0	0	0					0	0	0	0	0	0	+	0	+	agg.	agg.	agg.	+	±	±	+
Brain culture	±	agg.	+	+					±	+	+	±	+	agg.	+	agg.	+	agg.	+	±	+	agg.	+	±
Heart blood culture	+	agg.	+	±	agg	agg.	agg.	agg.	0	+	0	+	+	0	+	agg	+	agg.	+	agg.	±	agg.	±	±
Second mouse passage:																								
Mouse A:																								
Peritoneal exudate					agg.	agg.	agg.	+																
Brain culture	+	agg.	+	±	+	agg.	+	agg.					+	±	+	+	+	agg.	+	agg.	+	0	+	+
Heart blood culture	±	agg	+	±	+	agg.	+	agg.					+	±	+	+	+	0	+	+	+	±	+	+
Mouse B:																								
Peritoneal exudate					±	agg.	+	agg.																
Brain culture					agg.	agg.	+	agg.																
Heart blood culture					±	agg.	+	±																
Third mouse passage:																								
Mouse A:																								
Brain culture													+	±	+	±	+	agg.	+	agg.	+	agg.	+	+
Heart blood culture					+	agg.	+	±					+	agg.	+	+	±	±	+	+	±	±	+	+
Mouse B:																								
Brain culture					+	0	+	±																
Heart blood culture					+	agg.	+	agg																
Mouse C:																								
Brain culture					+	±	+	+																
Heart blood culture					+	agg.	+	±																
Subculture in dextrose blood broth					agg.	agg.	0	±	±	±	0	±	±	agg.	±	±	0	0	±	agg.	0	0	0	±
Second subculture in dextrose blood broth					±	agg.	+	+	+	±	+	+	+	agg.	+	+	+	+	+	+	+	±	+	±
Subculture in dextrose ascites broth	+	±	+	±	+	0	+	±	+	0	+	+	+	0	+	±	+	0	+	±	+	±	+	+

+=Swollen capsules with definite outlines.
agg.=Agglutination, no capsular swelling.
±=Partially swollen capsules.
0=No capsular swelling or agglutination.

SUMMARY AND CONCLUSIONS

Thirty-three strains of pneumococci were observed to react with agglutination or swollen capsules with two or more of the diagnostic serums of types X, XX, XXIX, and XXXI.

The incidence of these multiple reacting strains in a survey in northern California during the period January 20, 1939, to April 30, 1940, was 4.2 percent of all types. This was a greater incidence than for any of the four types alone.

Five of the strains were carefully studied and evidence is presented showing that the five strains are immunologically identical, and that they represent a distinct type of pneumococcus which crosses not only with types X, XX, XXIX, and XXXI serums but with highly potent type XI serum as well.

REFERENCES

(*1*) Eddy, Bernice E.: A study of pneumococcus typing serums for the purpose of standardizing a test for potency. Pub. Health Rep., **55**: 347 (March 1940).

(*2*) Forster, George F., and Shaughnessy, Howard J.: Occurrence of strains of pneumococci which react with more than 1 type specific antipneumococcal serum. Proc. Soc. Exp. Biol. and Med., **44**: 306 (May 1940).

(*3*) Heffron, Roderick: Pneumonia with special reference to pneumococcus lobar pneumonia. Commonwealth Fund, New York, 1939. See p. 56.

(*4*) National Institute of Health, United States Public Health Service, Memorandum "Minimum requirements for pneumococcus typing serums" (Processed) (January 1939).

(*5*) Walter, Annabel W.: Difficulties encountered in pneumococcal type determination. Am. J. Pub. Health, **28**: 54 (1938).

COURT DECISION ON PUBLIC HEALTH

Ordinance regarding sanitary privies upheld.—(Alabama Court of Appeals; *Lavender* v. *City of Tuscaloosa*, 198 So. 459; decided August 6, 1940.) An ordinance of the city of Tuscaloosa provided that persons not having modern toilet facilities connected with the city sewerage system should build and maintain certain specified types of sanitary privies; that such privies should be cleaned by the city scavenger, for which service fees were to be collected by the city from the persons served; and that the failure or refusal to pay such fees when they became due and payable was a criminal offense. A person was convicted in the lower courts of violating this ordinance, the complaint charging the use of a privy upon which the fees for cleaning had not been paid as required by the ordinance.

On appeal to the court of appeals the appellant contended (1) that the ordinance was violative of the Federal Constitution in that it deprived him of the protection of the due process of law clause of the fourteenth amendment, (2) that the ordinance was violative of the Federal and State Constitutions because it failed to define sufficiently the standard of guilt, and (3) that the complaint was vague and

indefinite in that it did not sufficiently inform the defendant of what he was called upon to defend or allow a reasonable joinder of issue thereon. With reference to these contentions the court was of the view that each of them was wholly without merit and said that it clearly appeared that the ordinance itself was a complete answer to, and a refutation of, them.

Another claim made by the appellant was that the ordinance violated the State constitution relative to a citizen's immunity from imprisonment for debt. Regarding this, however, the court said that the immunity from imprisonment for debt contemplated and provided in the constitution had application and was limited to debts arising out of contract and did not extend to and include a fine and costs imposed by the municipality for the willful neglect or refusal to comply with the public duty imposed upon the appellant by the terms of the ordinance upon which the prosecution was rested.

The judgment appealed from was affirmed.

DEATH DURING WEEK ENDED DECEMBER 28, 1940

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 28, 1940	Corresponding week, 1939
Data from 88 large cities of the United States:		
Total deaths	8,939	8,901
Average for 3 prior years	9,304	
Total deaths, 52 weeks of year	436,252	429,419
Deaths under 1 year of age	515	475
Average for 3 prior years	523	
Deaths under 1 year of age, 52 weeks	26,261	25,724
Data from industrial insurance companies:		
Policies in force	64,759,998	66,393,376
Number of death claims	9,893	10,624
Death claims per 1,000 policies in force, annual rate	8.0	8.3
Death claims per 1,000 policies, 52 weeks, annual rate	9.5	9.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 4, 1941

Summary

For the current week, 77,144 cases of influenza were reported in the United States as compared with 45,475 for the preceding week—the largest numerical increase since the beginning of the present epidemic. Some of these cases, however, may be delayed reports. The western and southern States reported the highest incidence of the disease, with Texas (32,983 cases), Kentucky (9,601), and Arkansas (6,516), recording the largest numbers of cases. Among the North Central groups of States, Kansas, with 2,453 cases (1,607 last week), reported the highest incidence.

The present epidemic of influenza first appeared on the West coast during the latter part of November of last year, and apparently has gradually extended eastward, principally along the southern tier of States, where the reported incidence has been preponderantly the highest. The New England and Middle Atlantic States have so far remained relatively free from the disease.

Influenza, measles, poliomyelitis, and whooping cough were above the 5-year (1935–39) median expectancy for the current week. The number of cases of poliomyelitis increased from 36 to 64, nearly half of which were reported in the Middle Atlantic and East North Central States (11 in New York, 7 in Ohio, and 17 in Wisconsin). No other States reported more than 3 cases.

One case of Rocky Mountain spotted fever was reported in Illinois, 3 cases of tularemia were reported in North Carolina, and 22 cases of endemic typhus fever were reported for the United States as a whole, 9 of which occurred in Georgia and 5 in North Carolina.

For the current week the Bureau of the Census reports 9,251 deaths in 88 major cities of the United States as compared with 8,939 for the preceding week and with a 3-year (1937–39) average of 9,280. As compared with the 3-year average, the influenza epidemic is not reflected in this urban mortality.

Telegraphic morbidity reports from State health officers for the week ended January 4, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Jan. 4, 1941	Jan. 6, 1940		Jan. 4, 1941	Jan. 6, 1940		Jan. 4, 1941	Jan. 6, 1940		Jan. 4, 1941	Jan. 6, 1940	
NEW ENG.												
Maine	0	2	2	40	10	10	37	91	91	2	0	0
New Hampshire	0	0	0	------	------	------	11	5	5	0	0	0
Vermont	0	0	0	99	------	------	24	32	32	0	0	0
Massachusetts	1	6	7	------	------	------	384	193	241	3	0	1
Rhode Island	0	0	0	------	------	------	0	150	135	0	0	0
Connecticut	0	0	2	10	7	14	12	204	143	0	1	2
MID. ATL.												
New York	15	12	26	[1] 77	[1] 16	[1] 23	1,471	222	375	1	0	6
New Jersey	9	12	17	20	16	16	582	17	24	1	0	3
Pennsylvania	16	24	43	------	------	------	1,457	33	83	5	2	2
E. NO. CEN.												
Ohio	7	39	39	56	5	7	479	37	37	0	4	4
Indiana	13	17	38	236	46	40	33	11	11	0	1	2
Illinois [3]	25	32	48	34	18	20	975	26	36	0	4	4
Michigan [3]	6	2	11	6	------	------	693	0	22	1	0	2
Wisconsin	0	0	2	64	49	49	369	155	155	0	0	1
W. NO. CEN.												
Minnesota	0	4	5	2	1	1	5	109	60	0	0	0
Iowa	18	3	4	43	2	2	132	48	48	1	1	3
Missouri	8	11	13	96	8	113	29	4	7	0	1	1
North Dakota	12	1	2	172	46	34	10	1	2	0	0	0
South Dakota	3	0	0	------	14	6	2	1	4	0	0	0
Nebraska	2	3	8	5	13	10	2	156	39	0	0	1
Kansas	3	6	10	2,453	238	16	112	172	9	0	2	2
SO. ATL.												
Delaware	1	2	2	------	------	------	17	1	6	0	0	0
Maryland [3]	2	4	7	16	24	24	4	1	72	1	0	3
Dist. of Col.	1	3	7	68	------	2	2	1	5	0	0	1
Virginia [4]	13	22	25	1,752	557	------	146	32	60	1	1	4
West Virginia [3]	7	9	12	54	15	66	43	3	14	0	0	0
North Carolina [4]	13	53	43	17	450	24	69	49	49	0	2	2
South Carolina	11	26	13	1,581	3,154	720	33	11	11	0	1	1
Georgia [4]	5	21	16	788	1,433	133	8	27	27	1	0	0
Florida [4]	1	10	13	32	107	5	2	11	11	0	1	3
E. SO. CEN.												
Kentucky	4	10	14	9,601	13	13	191	2	60	1	0	7
Tennessee	4	12	13	613	143	143	25	39	9	2	0	4
Alabama [4]	14	16	16	1,322	974	250	75	25	25	0	0	3
Mississippi [3] [4]	5	13	11	------	------	------	------	------	------	2	0	1
W. SO. CEN.												
Arkansas	12	17	14	6,516	336	181	16	3	5	0	0	2
Louisiana	9	12	12	3,235	15	20	2	1	7	1	0	1
Oklahoma	4	14	16	2,248	257	140	1	2	7	0	0	1
Texas [4]	24	25	34	32,083	453	453	19	69	51	0	0	1
MOUNTAIN												
Montana	2	1	1	893	81	41	2	15	15	0	0	0
Idaho	0	1	1	58	------	8	0	53	53	0	0	0
Wyoming	0	0	1	1,651	21	------	0	6	4	0	1	0
Colorado	3	5	9	1,066	163	21	92	37	37	0	0	1
New Mexico	0	2	4	220	8	2	55	0	5	0	1	1
Arizona	2	9	9	1,099	178	138	52	6	6	2	1	1
Utah [5]	1	0	0	2,344	320	------	18	96	48	0	0	0
Nevada	------	------	------	250	------	------	------	------	------	------	------	------
PACIFIC												
Washington	0	1	1	1,122	------	------	18	570	79	0	0	0
Oregon	0	5	2	1,172	281	71	29	66	23	0	0	0
California	16	21	31	3,030	163	78	34	90	126	3	1	5
Total	292	488	677	77,144	9,630	3,255	7,767	2,883	3,956	28	25	95

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 4, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Jan. 4, 1941	Jan. 6, 1940		Jan. 4, 1941	Jan. 6, 1940		Jan. 4, 1941	Jan. 6, 1940		Jan. 4, 1941	Jan. 6, 1940	
NEW ENG.												
Maine	0	1	0	7	5	19	0	0	0	0	0	0
New Hampshire	0	0	0	3	3	13	0	0	0	0	1	0
Vermont	0	0	0	10	2	9	0	0	0	0	0	0
Massachusetts	0	2	1	120	96	228	0	0	0	1	1	2
Rhode Island	0	0	0	4	6	24	0	0	0	0	0	0
Connecticut	1	0	0	34	72	68	0	0	0	0	0	1
MID. ATL.												
New York	11	4	2	263	290	549	0	0	0	3	4	4
New Jersey	0	0	0	144	177	130	0	0	0	0	0	1
Pennsylvania	0	2	0	258	370	370	0	0	0	10	9	9
E. NO. CEN.												
Ohio	7	1	1	264	393	378	1	3	4	1	7	4
Indiana	2	1	0	103	187	190	0	11	15	1	1	1
Illinois [3]	3	0	1	309	421	473	3	2	12	6	3	3
Michigan [3]	0	0	0	156	116	248	8	0	0	1	0	1
Wisconsin	17	6	0	118	141	188	5	4	10	1	2	0
W. NO. CEN.												
Minnesota	1	1	1	47	101	131	5	3	9	5	0	0
Iowa	1	3	0	45	69	100	1	16	16	1	0	0
Missouri	0	0	0	51	57	148	0	1	11	2	1	2
North Dakota	0	0	0	5	33	30	1	0	8	0	0	0
South Dakota	1	0	0	14	12	31	2	9	5	0	0	0
Nebraska	0	0	0	33	35	38	1	3	8	0	0	0
Kansas	0	1	1	67	142	167	0	0	11	0	2	2
SO. ATL.												
Delaware	0	0	0	12	11	14	0	0	0	0	0	0
Maryland [3]	2	0	0	27	56	56	0	0	0	1	2	2
Dist. of Col.	0	2	0	10	11	18	0	0	0	0	1	0
Virginia [4]	3	0	0	46	68	54	0	0	0	1	3	3
West Virginia [3]	1	0	0	36	65	64	0	0	0	2	1	2
North Carolina [4]	0	1	0	50	72	52	0	0	0	1	0	2
South Carolina	0	1	0	17	5	10	0	0	0	0	2	4
Georgia [4]	0	1	1	13	42	18	0	0	0	3	3	3
Florida [4]	3	0	0	3	14	12	0	0	0	0	2	1
E. SO. CEN.												
Kentucky	2	1	1	45	39	63	0	0	0	0	0	5
Tennessee	0	0	0	37	34	42	0	0	0	1	1	1
Alabama [4]	0	1	0	47	27	14	1	0	0	2	0	1
Mississippi [3] [4]	0	0	0	10	6	13	0	0	0	0	2	1
W. SO. CEN.												
Arkansas	0	0	0	11	31	20	0	4	2	1	2	2
Louisiana	0	1	1	5	18	18	0	0	0	12	1	7
Oklahoma	0	0	0	15	28	33	0	8	8	0	5	2
Texas [4]	3	0	1	26	45	73	3	0	1	4	4	9
MOUNTAIN												
Montana	0	0	0	26	39	37	0	1	13	0	0	0
Idaho	0	3	0	5	10	25	0	0	7	0	2	0
Wyoming	0	0	0	1	7	18	0	0	4	0	0	0
Colorado	0	0	0	30	33	54	8	5	6	1	4	1
New Mexico	0	0	0	6	6	16	0	0	0	3	2	3
Arizona	0	0	0	5	2	10	0	3	0	0	8	2
Utah [3]	0	1	0	7	18	26	0	0	0	0	0	0
Nevada	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
PACIFIC												
Washington	2	1	0	29	39	50	0	1	6	0	2	2
Oregon	2	0	0	11	32	41	0	0	5	2	1	1
California	2	8	3	78	111	234	1	0	12	4	2	5
Total	64	43	21	2,663	3,597	5,024	40	74	276	70	81	99

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 4, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough, week ended Jan. 4, 1941	Whooping cough, week ended Jan. 6, 1940
NEW ENG.		
Maine	50	41
New Hampshire	5	4
Vermont	15	54
Massachusetts	260	104
Rhode Island	11	21
Connecticut	71	59
MID. ATL.		
New York	375	389
New Jersey	103	89
Pennsylvania	524	216
E. NO. CEN.		
Ohio	245	132
Indiana	19	29
Illinois [2]	145	120
Michigan [3]	198	25
Wisconsin	98	103
W. NO. CEN.		
Minnesota	30	84
Iowa	9	4
Missouri	17	12
North Dakota	16	4
South Dakota	1	0
Nebraska	8	64
Kansas	85	20
SO. ATL.		
Delaware	14	13
Maryland [3]	59	46
Dist. of Col.	13	7
Virginia [4]	106	51
West Virginia [3]	39	8
North Carolina [4]	192	32
SO. ATL.—con.		
South Carolina	56	7
Georgia [4]	22	12
Florida [4]	6	2
E. SO. CEN.		
Kentucky	22	15
Tennessee	17	19
Alabama [4]	18	8
Mississippi [3] [4]	----------	----------
W. SO. CEN.		
Arkansas	10	1
Louisiana	4	2
Oklahoma	26	3
Texas [4]	112	55
MOUNTAIN		
Montana	13	2
Idaho	3	6
Wyoming	8	9
Colorado	23	27
New Mexico	15	7
Arizona	20	2
Utah [3]	32	52
Nevada	----------	----------
PACIFIC		
Washington	43	25
Oregon	6	52
California	154	91
Total	3,326	2,077

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended Jan. 4, 1941, Illinois, 1 case.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended Jan. 4, 1941, 22 cases, as follows: Virginia, 2, North Carolina, 5; Georgia, 9; Florida, 3; Alabama, 1; Mississippi, 1; Texas, 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended December 21, 1940

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	171	344	75	1,106	751	1,264	19	343	23	981	-------
Current week [1]	60	4,979	51	2,508	457	897	5	310	24	1,266	-------
Maine:											
Portland	0	----	0	2	1	1	0	0	1	7	20
New Hampshire:											
Concord	0	----	0	0	1	0	0	0	0	0	13
Manchester	0	----	0	0	1	2	0	0	0	0	16
Nashua	0	----	0	0	0	0	0	0	0	0	5
Vermont:											
Barre	0	----	0	0	0	0	0	0	0	0	1
Burlington	0	----	0	0	0	0	0	0	0	0	9
Rutland	0	----	0	0	1	0	0	0	0	0	4
Massachusetts:											
Boston	0	----	0	69	21	42	0	9	0	132	232
Fall River	1	----	0	0	1	11	0	0	0	20	14
Springfield	0	----	0	1	0	9	0	0	0	2	22
Worcester	0	----	0	69	5	7	0	0	0	0	63
Rhode Island:											
Pawtucket	0	----	0	0	0	1	0	0	0	0	16
Providence	0	1	0	0	2	2	0	2	0	4	61
Connecticut:											
Bridgeport	0	----	0	0	0	1	0	0	0	2	22
Hartford	0	----	0	0	4	3	0	0	0	5	44
New Haven	0	----	0	0	1	9	0	0	0	24	40
New York:											
Buffalo	0	----	0	41	7	18	0	7	0	87	118
New York	17	41	0	753	64	142	0	68	6	128	1,485
Rochester	0	----	0	2	2	1	0	2	2	7	68
Syracuse	0	----	0	0	3	1	0	0	0	13	49
New Jersey:											
Camden	0	----	1	57	2	9	0	0	0	1	30
Newark	0	----	0	55	2	21	0	2	0	18	85
Trenton	0	----	0	3	2	29	0	1	0	1	26
Pennsylvania:											
Philadelphia	1	4	2	370	26	67	0	16	1	129	491
Pittsburgh	2	3	1	1	18	17	0	6	1	32	155
Reading	0	----	0	23	1	4	0	4	0	16	32
Scranton	0	----	----	1	----	1	0	----	0	0	----
Ohio:											
Cincinnati	----	----	----	----	----	----	----	----	----	----	----
Cleveland	0	20	5	32	11	20	0	5	0	57	196
Columbus	1	----	0	0	4	8	0	0	0	12	92
Toledo	0	3	1	2	5	20	0	2	0	11	89
Indiana:											
Anderson	2	----	0	0	3	1	0	0	0	0	8
Fort Wayne	0	----	0	5	5	1	0	2	0	0	23
Indianapolis	2	----	1	4	7	31	0	1	0	2	100
Muncie	0	----	0	0	4	5	0	1	0	0	10
South Bend	0	----	0	0	2	0	0	0	0	0	17
Terre Haute	1	----	1	0	2	0	1	0	0	0	23
Illinois:											
Alton	0	----	0	0	0	5	0	0	0	0	6
Chicago	4	7	1	419	20	120	0	27	3	88	665
Elgin	0	1	0	1	4	0	0	0	0	0	19
Moline	0	----	0	0	0	1	0	0	0	0	8
Springfield	0	1	0	1	4	1	0	0	0	1	22
Michigan:											
Detroit	3	1	0	434	26	88	0	14	0	166	307
Flint	0	----	0	12	3	0	0	1	0	9	27
Grand Rapids	0	----	0	5	1	10	0	0	0	14	43
Wisconsin:											
Kenosha	0	----	0	0	0	1	[illegible]	0	0	0	11
Madison	0	----	0	1	0	2	[illegible]	0	0	1	16
Milwaukee	0	----	0	14	0	14	0	5	0	28	86
Racine	0	----	0	1	0	1	0	0	0	0	10
Superior	0	----	0	1	0	3	0	0	0	6	6

[1] Figures for Cincinnati, Shreveport, and Tacoma estimated; reports not received

City reports for week ended December 21, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	1	2	2	0	0	5	28
Minneapolis	0	------	0	2	2	24	0	0	0	12	106
St. Paul	0	------	0	1	0	9	0	0	0	19	63
Iowa:											
Cedar Rapids	0	------	------	1	------	4	0	------	0	0	------
Davenport	0	------	------	0	------	4	0	------	0	0	------
Des Moines	1	------	0	2	0	11	0	0	0	1	33
Sioux City	0	------	------	0	------	4	1	------	0	5	------
Waterloo	0	------	------	1	------	3	0	------	0	0	------
Missouri:											
Kansas City	0	------	1	3	6	7	1	10	0	20	91
St. Joseph	0	------	1	0	10	1	0	1	0	0	36
St. Louis	5	5	4	3	18	27	0	5	1	13	210
North Dakota:											
Fargo	0	------	0	0	0	3	0	0	0	2	6
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	0	0	1	0	0	0	0	10
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	4	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	8
Nebraska:											
Lincoln	0	------	------	2	------	4	0	------	0	1	------
Omaha	0	------	0	1	4	2	1	3	0	1	57
Kansas:											
Lawrence	0	6	0	2	0	0	0	0	0	0	4
Topeka	0	1	0	0	3	3	0	0	0	3	11
Wichita	1	118	0	1	3	3	0	1	0	7	26
Delaware:											
Wilmington	2	------	0	6	5	4	0	1	0	4	36
Maryland:											
Baltimore	0	2	1	0	4	17	0	17	0	45	232
Cumberland	0	------	0	0	2	0	0	0	0	0	11
Frederick	0	------	0	0	0	1	0	0	0	0	3
Dist. of Col.:											
Washington	2	3	2	3	10	8	0	7	1	14	172
Virginia:											
Lynchburg	1	------	0	0	0	0	0	0	0	2	6
Norfolk	0	34	0	2	1	0	0	0	0	3	37
Richmond	1	------	0	5	4	4	0	1	0	0	58
Roanoke	0	------	0	8	3	2	0	0	0	0	13
West Virginia:											
Charleston	0	1	0	0	1	1	0	1	0	0	11
Huntington	0	------	------	0	------	0	0	------	0	0	------
Wheeling	1	------	------	0	------	1	0	------	0	7	------
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	0	1	0	0	0	0	0	17
Wilmington	0	------	0	0	0	2	0	1	1	1	5
Winston-Salem	0	------	0	0	1	5	0	1	0	42	17
South Carolina:											
Charleston	0	45	0	15	1	1	0	2	0	0	19
Florence	0	4	0	0	2	0	0	1	0	0	9
Greenville	0	------	0	0	3	0	0	1	0	2	29
Georgia:											
Atlanta	1	17	0	1	4	2	0	7	0	2	80
Brunswick	0	------	0	0	0	0	0	0	0	1	4
Savannah	0	------	0	0	1	0	0	3	0	0	31
Florida:											
Miami	0	1	1	3	4	0	0	1	0	0	45
Tampa	0	1	0	0	1	2	0	1	0	0	23
Kentucky:											
Ashland	0	------	0	0	2	0	0	0	0	0	5
Covington	0	------	0	0	0	2	0	1	0	0	14
Lexington	0	------	0	96	0	1	0	0	0	12	11
Louisville	0	------	0	2	11	12	0	2	0	8	87
Tennessee:											
Knoxville	0	------	0	0	2	2	0	0	1	0	20
Memphis	0	1	1	14	1	7	0	4	0	1	81
Nashville	1	------	0	1	3	8	0	0	0	10	45
Alabama:											
Birmingham	0	7	0	2	4	1	0	3	0	5	57
Mobile	1	8	0	0	1	0	0	2	0	0	24
Montgomery	1	------	------	0	------	4	0	------	0	0	------

City reports for week ended December 21, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	32	------	1	------	1	0	------	0	0	------
Little Rock	0	114	0	0	5	0	0	0	0	0	21
Louisiana:											
Lake Charles	0	------	0	0	3	1	0	1	0	0	8
New Orleans	0	56	2	1	17	1	0	7	6	3	130
Shreveport	------	------	------	------	------	------	------	------	------	------	------
Oklahoma:											
Oklahoma City	0	132	1	1	2	0	0	0	0	2	34
Tulsa	0	------	0	0	5	0	0	1	0	3	23
Texas:											
Dallas	0	1	1	1	3	3	0	1	0	0	67
Fort Worth	0	------	0	5	3	3	0	2	0	0	37
Galveston	0	------	0	0	2	0	0	0	0	0	19
Houston	1	39	0	0	5	2	0	4	1	2	72
San Antonio	2	416	4	0	8	1	0	12	0	0	79
Montana:											
Billings	0	2	0	0	0	0	0	0	0	0	5
Great Falls	0	15	1	0	0	3	0	0	0	0	7
Helena	0	5	0	0	0	0	0	0	0	0	2
Missoula	0	3	0	0	2	2	0	0	0	0	7
Idaho:											
Boise	0		0	0	2	0	0	0	0	0	9
Colorado:											
Colorado Springs	0	------	0	0	0	3	0	3	0	0	13
Denver	2	105	3	16	3	2	0	2	0	16	95
Pueblo	0	------	0	38	0	2	0	0	0	5	13
Utah:											
Salt Lake City	0	------	2	2	3	0	0	0	0	6	33
Washington:											
Seattle	4	17	4	1	10	1	0	3	0	2	122
Spokane	0	324	1	0	3	5	0	0	0	1	30
Tacoma	------	------	------	------	------	------	------	------	------	------	------
Oregon:											
Portland	0	585	2	0	4	3	0	3	0	1	91
Salem	0	40	------	0	------	0	0	------	0	4	------
California:											
Los Angeles	0	2,999	9	2	17	13	0	21	0	26	441
Sacramento	2	123	1	1	8	3	0	4	0	1	50
San Francisco	0	443	1	0	16	2	0	7	0	14	218

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
Worcester	1	0	0
New York:			
Buffalo	1	2	0
New York	2	0	1
Pennsylvania:			
Philadelphia	1	0	0
Indiana:			
Indianapolis	0	0	1
Michigan:			
Detroit	0	0	1
Wisconsin:			
Milwaukee	0	0	1
Delaware:			
Wilmington	0	0	1
Maryland:			
Baltimore	0	0	1
District of Columbia:			
Washington	1	0	0
Virginia:			
Norfolk	1	0	0
Richmond	0	0	1
South Carolina:			
Florence	0	1	0
Tennessee:			
Knoxville	1	0	0
Louisiana:			
New Orleans	0	0	2
California:			
Los Angeles	0	1	0

Encephalitis, epidemic or lethargic.—Cases: Newark, 1; Philadelphia, 1; Great Falls, 1.

Pellagra.—Cases: Charleston, S. C., 2.

Typhus fever.—Cases: Florence, 2; Tampa, 1; Mobile, 3; Montgomery, 3; Fort Worth, 1; Houston, 2; Los Angeles, 1.

FOREIGN REPORTS

CANADA

Vital statistics—First quarter 1940.—The Bureau of Statistics of Canada has published the following preliminary statistics for the first quarter of 1940. The rates are computed on an annual basis. There were 19.7 live births per 1,000 population during the first quarter of 1940 as compared with 20.5 during the first quarter of 1939. The death rate was 9.9 per 1,000 population for the first quarter of 1940 and 11.0 for the same quarter of 1939. The infant mortality rate was 63 per 1,000 live births in this quarter as compared with 72 for the same quarter of 1939. The maternal death rate was 4.3 per 1,000 live births for the first quarter of 1940, and 4.4 for the same quarter of 1939.

The accompanying tables give the numbers of births, deaths, and marriages, by Provinces, for the first quarter of 1940 and deaths by causes in Canada for the first quarter of 1940 and the corresponding quarter of 1939.

Number of births, deaths, and marriages, first quarter, 1940

Province	Live births	Deaths (exclusive of stillbirths)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada [1]	55,617	27,984	3,523	238	17,079
Prince Edward Island	491	281	43		117
Nova Scotia	2,765	1,583	236	9	989
New Brunswick	2,682	1,258	230	13	675
Quebec	19,266	8,385	1,531	90	4,285
Ontario	16,126	9,947	745	68	6,014
Manitoba	3,336	1,604	198	17	1,261
Saskatchewan	4,237	1,620	245	20	917
Alberta	3,635	1,258	175	11	1,336
British Columbia	3,079	2,048	120	10	1,485

[1] Exclusive of Yukon and the Northwest Territories.

Deaths, by cause, first quarter 1940

Cause of death	Canada [1] (first quarter) 1939	Canada [1] (first quarter) 1940	Province: Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Automobile accidents	180	192	----	12	10	30	97	8	9	10	16
Cancer	3,071	3,189	22	173	118	875	1,176	196	196	157	276
Cerebral hemorrhage, cerebral embolism, and thrombosis	598	608	9	59	46	123	261	21	27	26	36
Diarrhea and enteritis	374	346	3	7	15	214	47	19	19	14	8
Diphtheria	105	51	----	1	6	32	8	1	5	2	1
Diseases of the arteries	3,030	3,149	29	140	122	618	1,550	174	146	116	254
Diseases of the heart	5,102	5,259	49	253	193	1,234	2,298	312	273	222	425
Homicides	26	28	----	1	----	3	12	3	5	2	2
Influenza	2,054	888	6	80	23	327	217	56	82	51	46
Measles	61	49	----	1	----	23	9	5	9	1	1
Nephritis	1,834	1,721	12	77	51	813	512	54	71	38	93
Pneumonia	2,660	1,883	35	123	115	531	605	128	129	97	120
Poliomyelitis	4	6	----	----	----	4	1	----	----	----	1
Puerperal causes	251	238	----	9	13	90	68	17	20	11	10
Scarlet fever	68	41	----	1	----	21	13	1	3	2	
Smallpox	1	----	----	----	----	----	----	----	----	----	----
Suicides	186	183	1	4	8	31	71	17	14	14	23
Tuberculosis	1,568	1,442	21	95	79	649	245	92	55	67	139
Typhoid fever	38	34	1	----	2	25	2	2	2	----	----
Other violent deaths	942	899	10	58	44	172	361	44	45	54	111
Other specified causes	---	7,480	73	449	362	2,476	2,365	436	488	350	472
Unspecified or ill-defined causes	---	151	10	16	33	46	12	4	7	12	11
Whooping cough	141	147	----	24	18	48	22	14	15	3	3

[1] Exclusive of Yukon and the Northwest Territories.

CUBA

Habana—Communicable diseases—4 weeks ended November 16, 1940.—During the 4 weeks ended November 16, 1940, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	16	----------	Tuberculosis	1	----------
Malaria	7	3	Typhoid fever	51	6
Scarlet fever	1	----------			

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended March 30, 1940.—During the 13 weeks ended March 30, 1940, cases of certain infectious diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	9,041	Puerperal pyrexia	2,118
Dysentery	32	Scarlet fever	13,382
Ophthalmia neonatorum	1,007	Typhoid and paratyphoid fever	192
Pneumonia	23,417		

England and Wales—Vital statistics—First quarter 1940.—The following vital statistics for the first quarter of 1940 for England and Wales are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar General, and are provisional:

	Number	Annual rate per 1,000 population		Number	Annual rate per 1,000 population
Live births	154,336	15.0	Deaths from—Continued.		
Stillbirths	6,198	.61	Influenza	10,499	1.04
Deaths, all causes	204,349	20.3	Measles	149	.01
Deaths under 1 year of age	11,876	[1] 77	Scarlet fever	57	.01
Deaths from:			Typhoid and paratyphoid fever	24	.00
Diarrhea and enteritis (under 2 years of age)	687	4.5	Whooping cough	167	.02
Diphtheria	556	.05			

[1] Per 1,000 live births.

England and Wales—Vital statistics—Year 1939.—The following vital statistics for the year 1939 for England and Wales are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar General, and are provisional:

	Number of deaths	Rate per 1,000 population		Number of deaths	Rate per 1,000 population
Diarrhea and enteritis (under 2 years of age)	2,812	4.5	Scarlet fever	216	.01
Diphtheria	2,171	.05	Typhoid and paratyphoid fever	113	.00
Influenza	9,033	.22	Whooping cough	1,273	.03
Measles	309	.01			

SCOTLAND

Vital statistics—Quarter ended September 30, 1940.—Following are provisional vital statistics for Scotland for the quarter ended September 30, 1940:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	15,625	12.4	Deaths from—Continued.		
Births	21,152	16.7	Lethargic encephalitis	17	
Deaths	14,208	11.2	Malaria	5	
Deaths under 1 year of age	1,215	[1] 57	Measles	97	0.08
Deaths from:			Nephritis, acute and chronic	304	
Appendicitis	72		Pneumonia (all forms)	446	.35
Cancer	2,057	1.63	Poliomyelitis	6	
Cerebral hemorrhage and apoplexy	971		Puerperal sepsis	17	
Cerebrospinal fever	70	.06	Scarlet fever	10	.01
Cirrhosis of the liver	40		Senility	432	
Diabetes mellitus	193		Suicide	103	
Diarrhea and enteritis (under 2 years of age)	191		Syphilis	19	
Diphtheria	160	.13	Tetanus	4	
Dysentery	6		Tuberculosis (all forms)	836	.66
Erysipelas	9		Typhoid and paratyphoid fever	5	
Heart disease	3,246		Other violence	921	.73
Homicide	6		Whooping cough	51	.04
Influenza	24	.02			

[1] Per 1,000 live births.

SWITZERLAND

Notifiable diseases—August 1940.—During the month of August 1940, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	22	Paratyphoid fever	25
Chickenpox	50	Poliomyelitis	46
Diphtheria and croup	28	Scarlet fever	233
German measles	8	Tuberculosis	225
Influenza	9	Typhoid fever	7
Malaria	1	Undulant fever	8
Measles	148	Whooping cough	168
Mumps	16		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of December 27, 1940, pages 2408-2412. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Rangoon.—During the week ended December 14, 1940, 10 cases of cholera were reported in Rangoon, India.

Plague

Argentina.—During the month of November 1940, plague was reported in Argentina as follows: Cordoba Province, 4 cases, 3 deaths; Santiago del Estero Province, 1 case, 1 death.

Azores Islands—St. Michael—Faja de Cima.—During the 4 weeks ended November 2, 1940, 1 case of bubonic plague was reported at Faja de Cima, St. Michael, Azores Islands.

Yellow Fever

Colombia—Santander Department.—During the month of September 1940, 1 case of yellow fever with 1 death was reported in Santander Department, Colombia.

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UNITED STATES PUBLIC HEALTH SERVICE

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DIVISION OF SANITARY REPORTS AND STATISTICS

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

December 1–28, 1940

The accompanying table summarizes the prevalence of eight important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of Disease." The table gives the number of cases of these diseases for the 4-week period ended December 28, 1940, the number reported for the corresponding period in 1939, and the median number for the years 1935–39.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.– For the 4 weeks ended December 28 there were 126,111 cases of influenza reported, the weekly incidence rising from 9,663 to 38,056 during this period. These figures may be compared with reports of from 4,000 to 7,000 cases per week during the corresponding period in 1939, and from 1,000 to 2,000 cases per week during preceding nonepidemic years.

The current epidemic started in the Mountain and Pacific regions, with a peak in reported cases in California during the week ended December 14 (13,133 cases). Other States in those regions followed with peaks in Washington, Oregon, Wyoming, and Nevada during the week ended December 21. By the end of the period (week ended December 28) the disease had spread into the South Central regions and practically every State reported the maximum weekly incidence up to that time. This was also the case in a few States in the South Atlantic and North Central regions. The epidemic had apparently not reached the New England and Middle Atlantic regions. In its place of origin and its travel from west to east the present epidemic resembles those of 1932–33 and 1928–29. The major epidemic of 1918–19 began in the Northeast and traveled generally to the west and south, as have several of the succeeding minor epidemics.

Later reports (week ended January 4, 1941) show a still further decline in the number of cases in the Mountain and Pacific regions, but each State in the South Central regions except Louisiana reported the highest weekly incidence up to that date; of approximately 56,500 cases reported from those regions, Texas reported 32,983, Kentucky, 9,601, and Arkansas, 6,516 cases. Virginia and South Carolina, in the South Atlantic region, continued to report an increase in the weekly incidence. The total number of cases reported for the week was 77,144.

Mortality records indicate that the cases have been of a mild type. A rise in the mortality rate from all causes in 92 large cities began in the latter part of November and while the weekly rates were slightly higher than those for the corresponding weeks in 1939 they compared very favorably with the preceding 3-year average rates. During the week ended December 21 when there were approximately 42,500 cases of influenza reported, the death rate for large cities was 12.2, as compared with 11.7, 12.0, and 12.0 for the corresponding week in 1939, 1938, and 1937, respectively; for the following week, when approximately 38,000 cases of influenza were reported, the death rate was 12.5 as compared with 12.4, 12.8, and 13.2 in the three preceding years.

Measles.—The number of cases of measles rose from approximately 13,000 during the preceding 4-week period to approximately 24,000 for the 4 weeks ended December 28. The number of cases was more than twice the number reported for the corresponding period in 1939, which figure (11,035) represented the 1935–39 median incidence for this period. The disease was unusually prevalent in the Middle Atlantic and North Central regions, only slightly above normal in the South Central regions, and comparatively low in all other regions. In the Pacific region the incidence of measles was unusually high during the years 1938 and 1939, but during the current year the number of cases has compared more favorably with the average of preceding normal years.

Poliomyelitis.—For the 4 weeks ended December 28 there were 260 cases of poliomyelitis reported, as compared with 265, 76, and 134 cases for the corresponding period in 1939, 1938, and 1937, respectively. While the incidence of this disease declined rapidly during the current period in all sections of the country, in the East North Central and South Atlantic regions, where the disease has been unusually prevalent, the incidence is still considerably above the normal seasonal expectancy. Each of the States in the East North Central region reported a relatively high incidence, while Virginia and West Virginia seemed mostly responsible for the excess in the South Atlantic region.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period, Dec. 1–28, 1940, the number for the corresponding period in 1939, and the median number of cases reported for the corresponding period 1935–39

Division	Current period	1939	5-year median	Current period	1939	5-year median	Current period	1939	5-year median	Current period	1939	5-year median
	Diphtheria			Influenza [1]			Measles [2]			Meningococcus meningitis		
United States	1,369	2,355	2,788	126,111	23,874	7,736	23,776	11,035	11,035	115	132	317
New England	17	28	52	50	21	26	1,435	1,900	1,900	9	5	12
Middle Atlantic	173	271	349	115	113	113	9,735	1,936	2,849	14	40	54
East North Central	205	378	477	1,854	337	494	7,626	1,492	1,492	16	15	42
West North Central	82	135	206	2,309	542	316	1,409	876	876	11	6	18
South Atlantic	321	658	658	3,981	10,659	2,007	922	869	962	21	25	57
East South Central	146	298	298	2,318	2,950	823	858	264	264	18	17	37
West South Central	304	384	406	33,612	2,546	2,554	535	274	369	15	7	31
Mountain	46	88	88	30,401	5,978	441	733	629	812		8	8
Pacific	75	115	156	51,471	728	301	523	2,795	2,795	11	9	13
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
United States	260	265	201	11,519	14,672	17,630	220	414	711	426	473	516
New England	1	10	2	858	717	1,022	0	0	0	16	18	18
Middle Atlantic	12	35	9	2,525	3,393	3,393	0	0	0	74	69	89
East North Central	110	23	23	3,722	4,702	5,623	79	48	79	45	68	78
West North Central	30	50	19	1,352	1,852	2,955	107	165	233	26	22	55
South Atlantic	39	24	22	1,148	1,364	1,246	1	4	4	87	89	92
East South Central	12	18	18	730	766	588	0	3	2	48	25	39
West South Central	14	21	21	362	442	725	13	57	32	84	115	121
Mountain	9	40	5	332	551	735	9	117	117	26	33	38
Pacific	24	44	34	490	885	1,194	11	20	145	20	34	46

[1] Mississippi, New York, and Pennsylvania excluded, New York City included.
[2] Mississippi excluded.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—Diphtheria again registered a record low level. The 1,369 cases reported for the 4 weeks ended December 28 was the lowest recorded number for this period in the 12 years for which these data are available. The current incidence compares with a total of 2,355 cases for the corresponding period in 1939 and 2,788 cases for the same period in 1938. Each section of the country reported the lowest incidence in recent years.

Meningococcus meningitis.—The relatively low incidence of meningococcus meningitis which has prevailed throughout the year was maintained during the current 4-week period. The number of reported cases (115) was less than 90 percent of the number recorded for the corresponding period in 1939 and slightly more than one-third of the 1935–39 median figure for the period. The incidence was relatively low in all sections of the country; in the Middle Atlantic and South Atlantic regions the incidence was the lowest reported during this period in 10 years.

Scarlet fever.—The incidence of scarlet fever was the lowest recorded for this period in the 12 years for which these data are available. The

number of cases (11,519) reported for the current 4-week period was less than 80 percent of last year's figure for the corresponding period and about 65 percent of the 1935–39 median incidence for the period. In the East South Central region the number of cases was slightly above the seasonal expectancy, but in all other regions the incidence was comparatively low.

Smallpox.—The incidence of smallpox was also relatively low. The total of 220 cases reported for the current 4-week period compared with 414, 711, and 1,338 cases reported during the corresponding period in 1939, 1938, and 1937, respectively. The situation was favorable in all sections of the country. While the number of cases reported in the East North Central section was considerably above that of last year, it stood at the 1935–39 median level.

Typhoid fever.—Typhoid fever also reached a new low level. The number of cases (426) reported for the 4 weeks ended December 28 was 10 percent less than the comparatively low incidence in 1939 and about 20 percent below the preceding 5-year median for this period. The only exception to the favorable situation was in the East South Central region, where an increase of approximately 25 percent over the seasonal expectancy was shown.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended December 28, based on data received from the Bureau of the Census, was 12.3 per 1,000 inhabitants (annual basis). The average rate for the corresponding period in 1937–39 was 12.2. Apparently the reported cases of influenza have been mild, for the death rate has been affected very little, if any, by the current epidemic.

A STUDY OF CERTAIN FACTORS WHICH INFLUENCE THE DETERMINATION OF THE MOUSE PROTECTIVE ACTION OF MENINGOCOCCUS ANTISERUM [1]

By MARGARET PITTMAN, *Associate Bacteriologist, United States Public Health Service*

Following Miller's (*1*) introduction of mucin to increase the lethal action of *Neisseria meningitidis* for mice there have been a number of reports which demonstrate the mouse protective activity of antimeningococcus serum. Reference to these reports was made in a previous paper (*2*). Furthermore, it has been shown that the mouse protective activity of the serum is associated with the specific antibody. In 1937,

[1] From the Division of Biologics Control, National Institute of Health.

Rake (*3*) reported that the Group I [2] protective power of antimeningococcus serum probably parallels the homologous specific antibody nitrogen content. Pittman, Branham, and Sockrider (*4*) showed by means of the "plate precipitation" reaction a close correlation between the amount of precipitation and the protective power of the antiserum. Subsequently, Rake and Scherp (*5*), using sera the precipitin content of which had been measured quantitatively by Scherp (*6*), demonstrated further the relation between the specific immune nitrogen content of the serum and the mouse protective capacity of the serum. Complete absorption of the sera with specific polysaccharide removed 90 to 99 percent of the protective antibodies. In addition, Alexander (*7*) has presented findings which suggest that there is a broad correlation between the mouse protective activity and the therapeutic value of meningococcus antiserum. Recently, McLeod (*8a*) and Branham (*8b*) presented evidence that the recovery of several patients suffering from Group II infections was influenced by treatment with serum containing homologous specific antibodies.

At present it seems that the best method available for evaluation of meningococcus antiserum is the mouse protection test. It is evident that the agglutinin titer (56°C.), which is now the criterion for approval, bears little relation to the protective action, excepting the fact that high protective action is not found when the agglutinin titer is low. The quantitative measurement of the specific immune nitrogen (*6, 9*) offers certain possibilities but there are two objections to this method. One is that carefully purified and standardized precipitinogens, which are necessary for the measurements, are not readily available; and the other is that an occasional horse serum contains a greater amount of precipitable immune nitrogen than mouse protective antibodies (*4*). The same objections are applicable to the turbidimetric method recommended by Little (*10*). The second objection is also applicable to the "plate precipitation" reaction.

In the performance of the mouse protection test, there has been lack of uniformity of techniques employed in the various laboratories. Consequently, the results obtained have not always been comparable. It therefore seemed desirable before adopting this method to make a detailed study of the different variables in order that the best procedures might be selected for the standard method. The results of the study are reported in this paper. It includes (*a*) the selection of a medium suitable for the maintenance of the virulence of the culture, (*b*) a comparison of the susceptibility of different cultural strains to antiserum, preparatory to the selection of a test culture, (*c*) a study of the susceptibility of mice as influenced by breed, sex, and weight,

[2] In this paper the word "Group" is used to designate immunological subdivisions of meningococci on the basis of soluble specific substances (probably capsular substances). In Group I are included those strains known as Type I and Type III in the Gordon-Murray classification, and in Group II only those strains known as Type II in the same classification.

(*d*) a comparison of different solutions for suspension of the culture, (*e*) a study of mucin in relation to variability of different lots and methods of preparation, and (*f*) the selection of the time interval between inoculation of serum and culture.

Material and methods.—The general procedures for the plate precipitation test, for the mouse protection test, and for the Reed-Muench method (*11*) of calculating results of the protection test have been described in a previous paper (*4*). Certain changes which were made in these procedures are as follows: In the precipitation test, 0.8, 0.4, and 0.2 cc. amounts of serum were each added to 16 cc. of melted agar in place of 1.0, 0.5, and 0.2 cc. amounts. Neopeptone solution was used for the first suspension of the culture instead of Ringer's solution.

Mice were inoculated with 0.5 cc. of the dilutions of serum; hence the actual amount which a mouse received was one-half of the amount in 1 cc. of the designated dilution.

Group I meningococci have been largely used throughout the study. In mouse protection tests, Strain No. 1027 was used unless otherwise indicated.

The media, cultures, mice, and mucin are described below under the respective headings.

CULTURE MEDIA

Many media have been used by different workers in the cultivation of meningococcus. In the majority of instances, however, the selection has been made largely on the basis of multiplication and longevity of the bacteria and not maintenance of virulence. In the performance of the mouse protection test it is essential that the cultural inocula contain uniformly highly virulent bacteria. We have studied the influence of eight media on the virulence of meningococci. Observations were made also for any change in agglutinability and in precipitation of immune serum in agar plates. Other media might well have been included in the study. The purpose was not, however, to determine how many media are suitable for maintenance of virulence but to select one which could be relied upon with some degree of certainty. The media which were employed are listed in table 1.

The cultures grown on these media had not previously been subjected to artificial cultivation. They were started on the different media either directly from spinal fluid or from a primary culture grown from spinal fluid. There were eight strains, all of Group I. No strains of Group II meningococcus in spinal fluid were available at the time for study. As quickly as possible after isolation, subcultures of each strain were stored in the ice box in the lyophile state. Cultures so preserved apparently retain their original characteristics. The dried cultures were used as controls in observing the changes in the bacteria after they had been maintained on the different media. The examinations were made after about 6 months and again after another 6 months.

The virulence of a culture was determined by inoculating mice with dilutions of the culture, in mucin, ranging from 10^{-5} to 10^{-9}. The highest dilution which killed more than half of the mice was considered the measurement of the virulence

of the culture. The original virulence of all eight cultures was 10^{-8} or 10^{-9}; cultures which killed in dilutions between 10^{-5} and 10^{-7} will be reported as decreased in virulence; and cultures which failed to kill in the 10^{-5} dilution will be reported as avirulent.

The agglutinability of a culture was tested with Types I and III and polyvalent (M17) antisera. The test tubes were incubated at 56° C. for 20 hours. The ability to precipitate immune serum was tested on agar plates containing 5 percent of serum M17.

The results of the study are summarized in table 1. On all eight media, the majority of the cultures remained highly virulent for 6 months. In this respect, however, the solid media were superior to the semisolid. Blood agar was the only one on which the same cultures showed no loss in virulence during this period. Yet on each of the other solid media, serum glucose, EDB (*12*), and egg, there was only one culture which showed any decrease in virulence. Furthermore, on each of these three media the meningococci remained alive longer between transfers than on blood agar. The egg slant was most favorable in this respect as the transfers were made only every 21 days. Although EDB is quite favorable for maintaining virulence, the difficulty of preparation makes it impractical for routine use.

Of the solid media, serum glucose was the only one on which maintenance was continued for 12 months. During the second 6-month period five cultures which had shown no change in virulence were carried. All decreased in virulence but none became avirulent. In the use of serum glucose agar we had been previously somewhat prejudiced owing to an immunological change in a Type IV culture when it was grown on this medium (*15*). With these eight Group I strains, however, there were no apparent immunological changes.

Of the whole, semisolid media were much better than the solid for maintaining the longevity of the cultures but they were inferior in maintaining virulence. The loss in virulence, however, was not rapid. More than half of the cultures after a year on the semisolid media killed mice in a dilution of 10^{-5} or higher. Five were as virulent as when originally isolated. The latter had been grown on Hitchens' medium. One had been transferred every 21 days and the other four had been transferred every 2 or 3 days. Three of the four, however, had lost their ability to remain in suspension in saline.

From the work of others it appears that the rapidity with which a culture loses certain of its characteristics may be influenced by whether or not it has been previously subjected to artificial cultivation. Kirkbride and Cohen (*16*) compared the influence of serum glucose and Hitchens' media on the precipitative activity of cultures on immune serum agar plates. If stock cultures, routinely maintained on serum glucose, were grown on Hitchens' medium, there was a rapid loss in ability to precipitate immune serum. On the other hand, if recently isolated cultures were grown on Hitchens' medium,

TABLE 1.—*Changes in 8 strains of meningococcus after being maintained on 8 media*

Medium	Transfer interval	6 months			12 months		
		Virulence	Agglutination	Precipitation	Virulence	Agglutination	Precipitation
5 percent rabbit blood agar slant	24 or 48 hours	6 unch (2 dead)	6 unch	6 unch	Discontinued		
5 percent horse serum 0.5 percent glucose agar slant	do	6 unch 1 avir (1 dead)	6 unch 1 sp	7 unch	5 decr 3 discontinued	5 unch	5 unch.
Dorset's egg slant	21 days	6 unch 1 avir (1 dead)	6 unch 1 sp	5 unch 1 negative	Discontinued		
EDB (4 percent extract) agar slant (*12*)	24 or 48 hours	6 unch 1 decr (1 dead)	7 unch	7 unch	Discontinued		
EDB (4 percent extract) 0.15 percent agar	21 days	5 unch 1 decr 2 avir	8 unch	8 unch	Discontinued		
Hitchens' (beef infusion 0.12 percent agar, 0.1 percent glucose, 0.5 percent NaCl) (*13*).	48 or 72 hours	6 unch 1 decr 1 avir	2 unch 6 sp	8 unch	4 unch 2 decr 2 avir	2 unch 6 sp	8 unch.
	21 days	7 unch 1 decr	7 unch 1 sp	8 unch	1 unch 6 decr 1 avir	6 unch 2 sp	8 unch.
Special 0.15 percent agar (beef infusion, 0.15 percent agar, 0.5 percent NaCl, 0.02 percent KCl and 0.01 percent $CaCl_2$) (*14*).	do	5 unch 2 decr 1 avir	6 unch 2 sp	8 unch	3 decr 5 avir	6 unch 2 sp	8 unch.
Plain 0.15 percent agar (beef infusion, 0.15 percent agar, 0.5 percent NaCl).	do	5 unch 1 decr 2 avir	7 unch 1 sp	8 unch	1 decr 3 avir (1 dead)	5 unch 2 sp	7 unch.

Unch.=Unchanged—Dilution of 10^{-8} or 10^{-9} killed more than half of mice
Decr.=Decreased—Highest dilution which killed more than half of mice was between 10^{-5} and 10^{-7}.
Avir.=Avirulent—Dilution of 10^{-4} failed to kill mice.
Sp.=Spontaneous.

there was less change in this activity. Cohen (*17*) extended the study and reported that the virulence of a stock culture, routinely maintained on serum glucose, was definitely decreased when grown on Hitchens' medium.

It is of interest to note, under the conditions of our experiments, that there was no correlation between spontaneous agglutination and virulence of a culture. At the time of the first testing of the cultures, 12 were agglutinated spontaneously; 9 of these were highly virulent, 1 was moderately virulent, and only 2 were avirulent. At the time of the second testing, the same number were agglutinated spontaneously; 5 of these were highly virulent, 4 were moderately virulent, and 3 were avirulent. On the other hand, 12 cultures which were avirulent showed no spontaneous agglutination.

There was also no correlation between virulence and precipitation of immune serum in agar with the exception of one culture from the egg medium which was avirulent and caused no precipitation. Cultures which killed mice in dilutions of 10^{-9} produced no better halos than cultures which failed to kill mice in dilutions of 10^{-5}. No doubt, if the cultures had been completely avirulent, a difference would have been observed.

From the viewpoint of simplicity of preparation and preservation of virulence, our results indicate that, of the media studied, the rabbit blood agar and the serum glucose agar are the most satisfactory for the routine maintenance of cultures for the mouse protection test. We have chosen the blood agar. Transfers are made daily or every 2 days. In order to be absolutely certain that the cultures are kept at maximum virulence, they are passed through mice about every 2 weeks. The bacteria are recovered from the peritoneal exudate. In case a culture is to be used only occasionally, it is preserved in the lyophile state. Before using this culture, which has been resting, several daily or twice daily transfers are made on blood agar in order to restore its original vigor.

THE TEST CULTURE

In order to select a suitable strain of Group I meningococcus for measuring the mouse protective potency of antiserum, a number of strains were studied. It was found that, although of comparable virulence, the strains varied considerably in their susceptibility to antiserum. In some instances more than twice as much serum was required to protect mice against certain cultures as against others. This finding is in accord with data recently published by Branham (*18*).

TABLE 2.—*The determination of the protective value of 3 sera with 2 strains of meningococci of unequal susceptibility to antiserum*

No. of culture	Dilution of culture (1.0 cc)	Calculated dilution of serum which protected 50 percent of mice		Potency—percentage of control, M19
		No 1	*M19*	
1027	2.5×10^{-4}	1:128	1:75	170
1041	2.5×10^{-4}	1:200	1:107	187
		No. 2		
1027	2.5×10^{-4}	1:335	1:135	174
1041	4×10^{-4}	1:460	1:240	191
		No. 3		
1027	2.5×10^{-4}	1:124	1:154	80
1041	3×10^{-4}	1:170	1:215	79

Although our cultures were not equally susceptible, each usually reacted similarly to all antisera, so that when the potency of the unknown serum was expressed in the percentage value of the control, comparable values were obtained for the serum. These findings are illustrated in table 2. In the experiments two cultures, 1027 and 1041, were used in determining the potency of three antisera.

In each instance more of the unknown serum was required to protect against 1027 than against 1041. Likewise, corresponding amounts of the control serum M19 were required to protect against the respective strains. Hence, comparable values for the potency of each serum were obtained with both cultures. Similar results were obtained with several other cultures; dissimilar results were obtained with only one culture.

Our results indicate that a number of strains of Group I could be used with equal success in evaluating the mouse protective action of antisera. It is essential, however, that the culture be of highest virulence. Cultures only moderately virulent induce irregular results.

The culture selected for the mouse protection test.—Culture 1027 was selected for determining the potency of the antisera against Group I meningococcus. This culture grows well on artificial media, its virulence is such that less than 10 organisms in mucin are lethal for a mouse, and mice are protected against many lethal doses of it with Group I specific immune serum. Furthermore, the protective value of a serum obtained by the use of this culture, in almost every instance, is definitely correlated with the amount of specific antibody as measured by the plate precipitation reaction. In 1938, Pittman, Branham, and Sockrider (4), using this strain, reported a correlation between mouse protection and precipitins. This study has been continued and at present more than 100 different sera have been tested. Only a few have shown a discrepancy.

MICE

The results of the study of influence of breed, sex, and weight of mice on the determination of the mouse protective action of antimeningococcus serum are given below.

Breed.—Mice of different strains and from different colonies of one strain were employed in the study. The most important factor seemed to be that the mice came from a pure, closely inbred line. Mice of different strains did vary in susceptibility to meningococci but mice from different colonies of the same strain likewise varied. This difference in mice from the same strain is illustrated in table 3. The mice were from two colonies bred at the National Institute of Health (NIH) and from a dealer; all were of Swiss origin, the stock of each line originally coming from the same source. It may be seen that about 35 percent less serum was required to protect the mice from the dealer than those from the NIH colony No. 1; and about 40 percent less to protect mice from the NIH colony No. 2 than those from the NIH colony No. 1.

TABLE 3.—*The difference in susceptibility of Swiss mice from 3 colonies*

Experiment No.	Calculated 50 percent endpoint of antiserum (M19)		Percent variation	Experiment No.	Calculated 50 percent endpoint of antiserum (M19)		Percent variation
	NIH (No 1) mice	*Dealer mice*			*NIH (No 1) mice*	*NIH (No. 2) mice*	
1	1 160	1.215	34	3	1 84	1.117	39
2	1·100	1.135	35	4	[1] 1·50	[1] 1:72	44

[1] Serum No 5

Male mice, 16–18 grams, were used in experiments 1, 3, and 4, male and female mice, 18–19 grams, were used in experiment 2

3 5 and 4 25 percent mucin suspensions were used in experiments 1 and 2, and 3 and 4, respectively.

These results show some of the variations in susceptibility that may arise in mice of the same strain. It is obvious that in order to obtain consistent results in mouse protection tests only mice from a pure, closely inbred line should be used.

Sex.—In table 4 are given the results of six protection tests in which the susceptibility of male and female mice was compared. Five tests were made with a Group I culture and one with a Group II culture. The mice were of comparable weights, between 16 and 18 grams. The males were about 5 weeks old and the females were approximately a week older.

It is shown that on an average about twice as much serum was required to protect the females as the males—in three instances twice as much was required, in one almost three times, and in another a little less than twice. It can be readily seen how irregular results may arise from the use of mice of both sexes if they are not equally distributed.

TABLE 4.—*The influence of sex on the protective action of meningococcus antiserum*

Group of culture	Dose of culture (1.0 cc.)	Concentration of mucin (percent)	Serum No.	Calculated 50 percent endpoint of serum with	
				Male mice	Female mice
I (1027)	1x10⁻⁴	3.5	M19	1:160	1:80
			No. 6	1:103	<1:40
	1x10⁻⁴	3.5	M19	1:144	1:91
			No. 7	1:120	1:43
	2x10⁻⁴	4.25	M19	1:105	1:48
II (963)	2x10⁻⁴	4.25	M19	1:13.5	1:6.5

Weight of mice 16–18 gm.
Mucin No. 35,689, plus 0.5 percent NaCl and 0.5 percent dextrose.

Weight.—The influence of the weight of mice on the determination of the protective action of antiserum is illustrated by two experiments, the results of which are recorded in table 5. In the first experiment, mice weighing 15 to 17 grams were compared with mice weighing 21 to 23 grams. The calculated dilutions of serum which protected 50 percent of the mice were 1:138 and 1:168, respectively. In the next experiment 15 to 16 gram mice were compared with 22 to 24 gram mice. In this instance with the wider variation in weight there was a corresponding variation in protection. The 50 percent protection endpoints of the serum were 1:156 and 1:308, respectively.

TABLE 5.—*The influence of weight on the protective action of meningococcus antiserum*

Weight of mice (grams)	Dilution of serum M19—0.5 cc. inoculum								Calculated 50 percent endpoint
	1:50		1:100		1:200		1:400		
15 to 17	6S		3S	3D	2S	4D	1S	5D	1:138
21 to 23	6S		6S		2S	4D		6D	1:168
15 to 16	4S	2D	5S	1D	2S	4D	2S	4D	1:156
22 to 24	6S		4S	2D	4S	2D	4S	2D	1:308

Equal number of males and females inoculated with each dilution of serum.
Test dose of culture = 1 cc. of 2.5×10^{-4} dilution.
Mucin No 35,689, 3.5 percent concentration, plus 0.5 percent NaCl and 0.5 percent dextrose.

The results of the work with mice show that inherent susceptibility, sex, and weight are influential factors in determining the protective action of antiserum. Variations in any one of the factors may give rise to irregular results. By controlling these variables, however, we have found that it has been possible to duplicate the results of a mouse protection test with as few as 24 or 30 mice for a serum.

In the use of mice, one other factor should be mentioned. It is environmental temperature. We have noted that during the hot summer months in Washington mice are much less resistant to meningococci than during the winter. Dilutions of serum which will protect

half of the mice against a given dose of culture during the winter fail to protect any against the same dose during hot weather. Furthermore, the survival time after infection is also decreased. In order to obtain results in the summer comparable to those obtained in the winter, it is necessary to use a smaller test dose of culture or to decrease the concentration of mucin. Colvin and Mills (*19*), in work with controlled environmental temperatures, have demonstrated that mice kept at 90° F. are less resistant to hemolytic streptococci than mice kept at 65° F.

SOLUTION FOR SUSPENSION OF CULTURE

In preparing a culture for the mouse protection test it is the general practice to suspend it first in a clear solution in order that an estimate of the number of organisms can be made by comparing it with a turbidity standard. A number of solutions have been employed by different workers. The list includes distilled water, saline, Ringer's, Locke's (plus 0.1 percent gelatin), and meat infusion broth. We have compared the influence of each of these, with the exception of the broth, on the viability of meningococci. Solutions of proteose peptone and of neopeptone were also included. The latter solutions contained 1 percent peptone and 0.5 percent sodium chloride.

The procedure for the test was as follows: A suspension of a 5-hour-old blood agar culture was prepared in neopeptone solution Its density corresponded to that of 500 parts per million of silica (*20*) One cubic centimeter of the suspension was added to 4 cc. of each of the solutions to be studied. These dilutions were designated as 1×10^{-1}. Serial dilutions $\times$ 10 were made as quickly as possible to 1×10^{-8} in the respective diluents. Beginning with the 1×10^{-5} dilution, 0.2 cc. of each was cultured in special 0.15 percent agar simultaneously with the making of the dilution. After an interval of 30 minutes and again after 2 hours subcultures were made from the dilutions. The growth which took place in the subcultures was read after 24 hours of incubation; the tubes were examined again after 72 hours in order to make sure that no growth had occurred in the tubes that had been negative on first reading.

After the last subcultures had been made from the different dilutions, all of the latter tubes were placed in the incubator for 24 hours, after which time 1 loopful was cultured on a blood agar plate.

The results of one experiment in which distilled water, saline, Ringer's, and neopeptone solutions were used are given in table 6.

From the dilutions in neopeptone solution, comparable amounts of growth were obtained in the subcultures made simultaneously with the dilution of the culture and 30 minutes and 2 hours after diluting. This solution was apparently in no way injurious to the bacteria. Moreover, multiplication took place in each of the original dilutions.

On the other hand, in the presence of each of the other three solutions, there was rapid dying of the bacteria. Distilled water was the most injurious, saline was less, and Ringer's was least. But even

in the presence of the latter there was marked reduction in the number of bacteria within 30 minutes. Furthermore, in certain other experiments the number of bacteria recovered in the subcultures from Ringer's solution made immediately after diluting were less than from corresponding dilutions in neopeptone solution.

TABLE 6.—*The survival of meningococci in distilled water, saline, Ringer's, and neopeptone solution*

Diluent	Time interval between diluting and subculturing	Growth of subcultures from dilutions							
		10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}
Distilled water	Simultaneous					++	(7)	(1)	−
	30 min		++++	++	(1)	−	−	−	−
	2 hrs	++++	+++	−	−	−	−	−	−
	24 hrs.*	±	−	−	−	−	−	−	−
0.85 percent NaCl	Simultaneous					+++	++	(4)	−
	30 min		++++	++++	+++	(11)	(10)	(1)	−
	2 hrs	++++	++++	++	(1)	−	−	−	−
	24 hrs.*	++++	−	−	−	−	−	−	−
Ringer's	Simultaneous					++++	++	+	(3)
	30 min		++++	++++	++	(10)	(3)	(1)	−
	2 hrs	++++	++++	++	+	−	−	−	−
	24 hrs *	++++	+	−	−	−	−	−	−
Neopeptone	Simultaneous					++++	++	+	(7)
	30 min				++++	++++	++	+	(3)
	2 hrs			++++	++++	++++	++	+	(8)
	24 hrs *	++++	++++	++++	++++	++++	++++	+++	+++

−, ±, +, ++, +++, ++++ = None, very slight, slight, moderate, good, and heavy growth from 0.2 cc. in special 0.15 percent agar medium.
( ) = Number in parentheses indicates actual number of colonies.
* = One loopful of a dilution cultured on blood agar plate.

In other experiments which included Locke's solution containing 0.1 percent gelatin and proteose peptone solution, it was observed that the survival of the meningococci in Locke's solution was similar to that in Ringer's solution, while in proteose peptone solution it was similar to that in neopeptone solution. In the original dilutions in proteose peptone solution the growth was more luxuriant than in the presence of neopeptone.

Our observations on the viability of meningococci in distilled water, saline, and Ringer's solution, in general, are in agreement with the findings of Flexner (*21*) which were reported in 1907. He found that meningococci suspended in distilled water fragmented more rapidly than in saline, that saline was directly injurious to the organism, and that viability was more prolonged in Ringer's solution than in saline.

On account of the rapidly injurious action of distilled water, saline, Ringer's, and Locke's solution on meningococci, it would seem advisable not to use any one of them for the suspension of meningococci for the mouse protection test.

On the other hand, neopeptone and proteose peptone apparently are not only not harmful to the bacteria but are favorable for multi-

plication. We have selected neopeptone for use in our routine mouse protection tests. It should be mentioned, however, that in freshly prepared solutions of neopeptone, growth is not always initiated in the higher dilutions of the culture. In this case, if the solution is permitted to stand at room temperature for a week or two, this inhibitory action disappears and inocula of less than 10 meningococci will promote multiplication.

MUCIN

Mucin has been one of the most troublesome variables in the performance of the mouse protection test. During the early work, investigators found that different lots of mucin prepared by the same manufacturer varied tremendously in their influence on the lethal action of meningococci in mice. At times the use of a mouse protection test as a means of evaluating antimeningococcus serum seemed almost hopeless. Recently, however, better preparations of granular mucin have been available, but even these may vary in influence on lethal action of meningococci and on primary toxicity for mice. The difference in the effect of two lots of mucin on the viability of meningococci will be demonstrated below.

Different methods of preparing suspensions of mucin for the mouse protection test have been employed by various workers. Some have used distilled water suspensions with or without the addition of dextrose, while others have added 0.5 percent sodium chloride. Both the autoclave and the Arnold sterilizer have been used in the sterilization of the suspensions. In the present work we have determined the viability of meningococci in suspensions of mucin prepared by the different methods. We have also observed the influence on the mouse protection test of distilled water and saline suspensions of mucin, and of suspensions sterilized in the autoclave and in the Arnold sterilizer. Data on the influence of viscosity of mucin and the proper concentration of mucin for the mouse protection test are given.

The viability of meningococci in suspensions of mucin.—Two lots of mucin, Nos. 31,111 and 35,689, were used. Suspensions of No. 31,111 were dark, slightly viscous, and contained many hard particles. Suspensions of No. 35,689 were creamy, very viscous, and contained practically no hard particles.

A 5 percent suspension of each lot was prepared in distilled water, sterilized in the autoclave, and adjusted to pH 7.4. Each solution was divided into four portions. To one nothing was added, to the second 1 percent dextrose, to the third 0.5 percent sodium chloride, and to the fourth both 1 percent dextrose and 0.5 percent sodium chloride.

In each of the different preparations serial dilutions × 10 of a 5-hour-old blood agar culture suspended in neopeptone solution (density 500 p. p. m.) were made. Similar dilutions were made in neopeptone solution. After the dilutions had stood for 2 hours at room temperature, 0.1 cc. of each was cultured in special 0.15 percent

agar. Then the dilutions were placed in the incubator and after 48 hours 1 loopful of each was cultured on a blood agar plate.

The results of an experiment with the two lots of mucin prepared by the different methods are given in table 7.

In the presence of all preparations containing mucin No. 31,111 there was dying of the bacteria. It was most rapid in the distilled water suspension. In the presence of dextrose or sodium chloride the death was slower while in the presence of both dextrose and sodium chloride conditions were still more favorable for the bacteria. Although the time interval for the subculturing in this experiment was 2 hours, in preliminary tests it was found that even within 30 minutes in a suspension of this mucin containing dextrose there was a decided decrease in the number of bacteria.

In the presence of mucin No. 35,689 (table 7) there was less dying of the bacteria than in presence of the other lot of mucin but only when both dextrose and sodium chloride were added were the conditions most favorable. However, there was multiplication of the bacteria in all dilutions of each preparation of this lot of mucin except in the distilled water preparation.

TABLE 7.—*The influence of dextrose and sodium chloride on the viability of meningococcus in mucin*

Diluent	Growth in subcultures from culture dilutions in mucin								
	After 2 hours—0.1 cc [1]				After 48 hours incubation—1 loopful [2]				
	5×10^{-6}	5×10^{-7}	5×10^{-8}	5×10^{-9}	5×10^{-5}	5×10^{-6}	5×10^{-7}	5×10^{-8}	5×10^{-9}
Neopeptone	++++	++++	+	±	------	------	++++	++++	++++
Mucin No. 31,111	++++	−	−	−	−	−	−	−	−
plus 1 percent dextrose	++++	++	−	−	−	−	−	−	−
plus 0.5 percent NaCl	++++	++++	−	−	±	−	−	−	−
plus 1 percent dextrose + 0.5 percent NaCl	++++	++++	++	−	+++	−	−	−	−
Mucin No. 35,689	++++	++++	−	−	±	−	−	−	−
plus 1 percent dextrose	++++	++++	−	−	++++	++++	++++	++	+
plus 0.5 percent NaCl	++++	++++	++++	−	++++	++++	++++	++++	++++
plus 1 percent dextrose + 0.5 percent NaCl	++++	++++	++++	++++	++++	++++	++++	++++	++++

[1] Subcultures were made in special 0.15 percent agar and incubated for 4 days
[2] Subcultures were made on blood agar plates.

In other experiments 1 percent proteose peptone was added to water suspensions of each of the two lots of mucin. In the presence of each there was no injurious action on the bacteria. Even in the presence of mucin No. 31,111 there was multiplication of the bacteria in all dilutions.

Although the test-tube experiments with suspensions of mucin containing dextrose but not sodium chloride indicated that such suspensions were injurious to the bacteria, this action was further demonstrated in a mouse protection test. Two sets of mice were inoculated,

45 minutes apart, with the same dilutions of an antiserum. The mice of the first set were inoculated with a culture immediately after it had been suspended in the mucin solution (No. 31,111) containing 1 percent dextrose, and the mice of the other set were inoculated with the same cultural suspension after it had been held about 45 minutes. The dilution of serum which protected 50 percent of the first mice was 1:47, and in the second case it was 1:90; that is, only one-half as much serum was required to protect the mice against the bacteria that had been exposed to the injurious action of the suspension of mucin for 45 minutes. In a similar experiment in which the mucin suspension contained 0.5 percent sodium chloride, the dilutions of serum which protected the mice of each set were comparable.

Sterilization of mucin.—Whether the mucin is sterilized in the autoclave or in the Arnold sterilizer does not seem to make any particular difference in the results of the mouse protection test. The results of two experiments performed at different times are as follows: In the first, the calculated dilutions which protected 50 percent of the mice were 1:163 and 1:150, respectively. In the second, the dilutions were 1:147 and 1:168, respectively.

With autoclaved mucin, it has been noted that certain preparations are slightly toxic for mice. This toxicity, however, disappears if the preparation is allowed to stand for about 2 weeks before use. When sterilizing in the autoclave, great care is taken to prevent the pressure going over 15 pounds (121° C.). Thirty minutes is used for amounts of 1,000 cc., and 20 minutes for 500 cc. or less. For sterilization of the same amounts in the "Arnold," we have used, respectively, 1 hour and 30 minutes on 3 successive days. With "Arnold" mucin we have had some difficulty with lack of sterilization.

Viscosity of mucin.—It is interesting to note that although the suspensions of mucin sterilized differently induced similar results in the mouse protection test, they do differ in viscosity. Preparations of 3.5 percent mucin sterilized in the autoclave have been found to have an average viscosity of 9.0, while like preparations sterilized in the "Arnold" have a viscosity of about 12.0.

The fact that viscosity alone is not the determining factor of mucin which increases the lethal action of meningococci for mice was very strikingly demonstrated with a preparation that had been improperly sterilized in the "Arnold" due to escape of steam. (The stopper holding the thermometer in the top of the sterilizer had inadvertently been left out of place.) This mucin was used on the final day of sterilization in a mouse protection test. Although no contaminating organisms were seen in the peritoneal smears of the mice which died, 2 weeks later the mucin contained a toxigenic gram-positive spore-forming rod. The viscosity of this preparation was 18.6. In the

same experiment a preparation of autoclaved mucin of the same concentration with a viscosity of 8.7 was also used. With the "Arnold" mucin the 50 percent endpoint dilution of serum M19 was 1:159, and with the autoclaved mucin it was 1:177.

The comparable results obtained in the mouse protection tests with preparations of mucin which contain the same concentration of mucin but which differ in viscosity substantiate the conclusion of Anderson and Oag (*22*) that it is not viscosity *per se* which enables a substance to increase the lethal action of meningococcus for mice.

Concentration of mucin.—It has not been possible to use a fixed concentration of mucin for the mouse protection test. The amount has had to be adjusted for the particular lot of mucin, for the susceptibility of the mouse as influenced by breed and weather, and the immunological group of the test culture.

For Group I cultures, with mice from the open market and mucin lot No. 31,111, a 5 percent suspension of mucin was used with a 1×10^{-3} to 5×10^{-4} dilution of the culture. With mucin lot No. 35,689, it was necessary to decrease the dilution of the culture to about 1×10^{-4}, the other factors remaining constant. With the shift to inbred Swiss mice the concentration of mucin was reduced to 4 percent and later to 3.5 percent during the summer. With 3.5 percent mucin the dilution of culture has varied from 1 to 2.5×10^{-4}.

For Group II cultures it has been necessary to use a slightly higher concentration of mucin than with Group I cultures.

It is believed that the minimum concentration of mucin that will render at least 10 highly virulent meningococci lethal for more than half of the mice inoculated, should be used.

TIME INTERVAL BETWEEN INOCULATION OF SERUM AND OF CULTURE

In a study of the mouse protection test, Branham (*23*) reported in 1935 that, on the whole, the best protection was obtained when serum was given 4 hours preceding the culture. The other time intervals which she used were 1, 8, 12, and 24 hours preceding the culture. In her work relatively large doses of serum, at times as much as 0.5 cc. of undiluted serum, were used to protect against large numbers of meningococci which were not suspended in mucin. Other workers have given the serum 30 to 60 minutes before the culture, while still others have given it either simultaneously or mixed with the culture. In our more recent work a time interval of 1 hour has been used. This interval was selected after studying the influence of inoculating the serum 4 hours and 1 hour before and simultaneously with the culture.

It was found that the selection of the best time interval between inoculation of serum and culture was dependent on the size of the test dose of culture. With large amounts of culture and corresponding

amounts of serum the best protection was obtained when the serum was given 4 hours in advance. With a small number of bacteria and high dilutions of serum the best protection was obtained when the inoculations were made simultaneously. With intermediate-size inocula the greatest protection was obtained with the hour interval. These findings are illustrated in tables 8, 9, and 10.

TABLE 8.—*The influence of time interval between inoculations of a large amount of serum and varying amounts of culture*

Experiment No.	Serum [1]	Time interval (hours)	Dilution of culture—1 cc. inoculum						Calculated 50 percent endpoint of culture
			1:100		1:1,000		1:10,000		
			S	D	S	D	S	D	
1	M19	4	3	5	4	4	5	3	1:1,000
		(2)	0	8	2	6	7	1	1:2,500
2	No. 9 Concentrated	4	2	6	8	0	8	0	1:210
		1	0	8	3	5	7	1	1:1,900
		(2)	2	6	3	5	4	4	1:2,600

[1] Each serum diluted 1:5, 0.5 cc. inoculated.
[2] The serum and culture were inoculated simultaneously.
Male mice 18-20 gm.
Mucin No. 35,680, 3.5 percent concentration, plus 0.5 percent NaCl and 0.5 percent dextrose.

TABLE 9.—*The influence of time interval between inoculations of small amounts of serum and a constant amount of culture*

Time interval	Amount of culture	Dilution of serum [1]—0.5 cc. inoculum						Calculated 50 percent endpoint of serum
		1:200		1:400		1:800		
		S	D	S	D	S	D	
4 hours	1.0 cc. of 2 x 10^{-5}	5	3	4	4	0	8	1:310
1 hour		6	2	4	4	1	7	1:365
None [2]		6	2	5	3	4	4	1:540

[1] Serum No. 9 concentrated.
[2] Serum and culture injected simultaneously.
Equal distribution of male and female mice; weight, males 18-20 gm.; females 16-18 gm.

TABLE 10.—*The influence of time interval of inoculation of serum on the amount required to protect against approximately 100,000 m. f. d. of culture*

Time interval	Dilution of serum M19—0.5 cc. inoculum								50 percent endpoint of serum
	1:50		1:100		1:200		1:400		
	S	D	S	D	S	D	S	D	
4 hours	3	2	3	3	3	3	1	5	1:114
1 hour	4	2	5	1	4	2	0	6	1:175
None [1]	3	3	2	4	2	4	3	3	1:100

[1] Serum and culture inoculated simultaneously. Test dose of culture=1 cc. of 2.5 x 10^{-4} dilution. Equal number of male and female mice, 16-17 gm.

In table 8 are given the results of two experiments. The mice were inoculated with 0.1 cc. of serum and varying amounts of culture. In each instance the mice were protected against the largest amount of culture when the serum was given 4 hours in advance and against the least amount when serum and culture were given simultaneously.

In the next experiment recorded in table 9, a moderately high dilution of culture, 2.5×10^{-6} (approximately 10,000 m. f. d.) was inoculated with varying dilutions of serum. Under these conditions the best protection was obtained when the serum and culture were given simultaneously and least when serum was given 4 hours in advance.

In table 10 are given the results of an experiment with intermediate inocula. In this case the optimum protection was obtained when the serum was given 1 hour in advance, and poorest when given with culture. The test dose of culture contained approximately 100,000 m. f. d. This size inoculum has been advocated by several workers. It has not seemed advisable to use a larger dose because of the primary toxicity of meningococci for mice.

It may also be noted in table 10 that in case of the simultaneous inoculations, the protective action of varying dilutions of serum was not clearly differentiated. This finding has been observed in other experiments. Furthermore, with certain concentrated sera the occurrence of a marked prozone has been observed following simultaneous inoculation of serum and culture. The least occurrence of prozones has been noted when the serum was given 4 hours in advance.

The above results suggest that to obtain the maximum mouse protection with an antiserum, the choice of the time interval to be used between inoculation of serum and culture is dependent on the size of the test dose of culture. If a test dose of 100,000 m. f. d. is used the best results are apparently obtained when the serum is given 1 hour preceding the culture.

SUMMARY

The results of the comparative study of different variables or factors which influence the determination of the mouse protective action of antimeningococcus serum indicate that:

1. Five percent rabbit blood agar is a satisfactory medium for the maintenance of the virulence of meningococci. Serum glucose agar, EDB agar, and Dorset's egg medium are almost as favorable as the blood agar. On semisolid media the bacteria remain alive longer but there is a gradual loss in virulence.

2. Although different Group I strains of meningococcus differ in susceptibility to antiserum, it appears that comparable values in relation to control serum may be obtained with a number of strains.

3. Mice of different strains and from different colonies of the same strain may vary in susceptibility to meningococci. The important factor is that they come from a pure, closely inbred line. Furthermore, with closely inbred mice it has been demonstrated that about twice as much serum is required to protect females as males and that wide variations in weight cause irregular results.

4. In distilled water, saline, Ringer's or Locke's solution, meningococci die very rapidly and the use of either for the first suspension of the culture is contraindicated. Neopeptone or proteose peptone solutions are not injurious to the bacteria and may be used for the suspension fluid.

5. Different lots of mucin vary in influence on the viability of meningococci.

Preparations of mucin which contain both sodium chloride and dextrose appear to be the most favorable for the bacteria.

Comparable results are obtained with suspensions of mucin sterilized in the autoclave and in the Arnold sterilizer though they do differ in viscosity.

6. To obtain the maximum protection with antiserum, the time interval between inoculation of serum and culture is dependent on the size of the test dose of culture. With a test dose of 100,000 m. f. d., it appears that the best protection is obtained when the serum is inoculated 1 hour in advance of the culture.

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WHAT INDUSTRY HAS LEARNED ABOUT LEADERSHIP [1]

ITS APPLICATION TO PUBLIC HEALTH

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During the last quarter century industry has become increasingly concerned about the worker's job satisfaction. In order to promote a greater degree of satisfaction, it has fostered a number of programs to improve working conditions and help workers adjust themselves to their jobs. Among the developments toward this end are welfare departments, personnel departments, wage plans, annual income guarantees, and many other similar devices.

As recently as 1934, however, Dr. Robert Hoppock, in his illuminating study, "Job Satisfaction," pointed out that probably one out of every three workers is more or less dissatisfied with his job. Even though the dissatisfaction is frequently the result of the worker's own incapacity, industry continues its effort to remove it. But Schopen-

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Editorial Note.—A health officer's success as administrator of the public health program depends in large measure upon his ability as a leader. As the executive, responsible for the maintenance of staff morale and a high level of performance by his subordinates, the health officer requires the abilities, attitudes, and other traits that characterize good leaders.

Industry has found it profitable to study intensively the characteristics of its best leaders and to institute programs to improve the qualities of leadership possessed by its executives and subexecutives. Many of the principles found useful in industry can be practiced to advantage by health officers and other supervisory public health workers. Hence this paper, prepared by a man who has concentrated on the development of leaders in his own organization, is presented.

hauer taught, as you will recall, that every satisfaction leads to a new struggle, implying that continued satisfaction is impossible without annihilating desire. Experience has proved that the dissatisfactions of yesterday adjust to become routine operations today, and new dissatisfactions will appear tomorrow.

As a result, industry has been seeking some common factor upon which it could concentrate to secure a greater continuing satisfaction, and perhaps serve to "annihilate desire" in this particular. The most powerful common factor seems to be that of leadership. There is nothing new in this, except that in industry, as well as in other fields, it has heretofore been considered that leadership was a characteristic impossible to develop in those not born with it. But, just as it is no longer thought that salesmen are born and not made, it is now agreed that men may at least be trained to be better leaders. Given certain fundamental capacities, their ability as leaders may be improved through training.

You may all be thinking at this point, "What has this to do with me and public health?"—and well you might. I had much the same feeling when I was asked to prepare this paper. But reflection will show you, I am sure, that training for leadership has a very great deal to do with the men and women in public health work.

Let us consider for a moment the training that most public health officers have had. Throughout their training, their internship, and their clinical work, the whole emphasis has been on the relationship of the doctor to his patient—individual to individual. If most doctors are like the ones that I have known they have learned to impose their opinions upon their patients and have not found it necessary to "sell" their patients. It is, "Stop smoking or expect to have trouble,"—not a sales talk on the desirability of discontinuing smoking. This may be necessary, and I have no criticism of it. But when doctors become public health officers with staffs of people to handle, possibly this method of handling the human relationship problem may not be so successful. Frequently the energies of both the physician and his staff are vitiated by conflicting personalities.

Leadership has been defined by a very competent woman in the retail industry as the functioning of personality so as to secure immediate and spontaneous cooperation. I am sure that you will all agree that immediate and spontaneous cooperation in any field of human endeavor is a matter eagerly to be sought and greatly to be desired. Before discussing the qualities of good leadership, let us examine the idea of leadership as it has been recast under present social conditions. Too many of us think of leadership in terms of our school-day reading —the hero fighting on a battlement while his troops fall around him, Bismarck with his iron will and his iron fist welding a nation out of unrelated principalities, the Little Corporal from Corsica plunging

Europe into blood, captains of industry and finance building great empires of economic wealth, zealots leading important movements in the sweeping progress of civilization.

But the leadership we speak of here is warmer, more human. It is a quality that can be developed in any intelligent person willing to work patiently toward understanding and consideration. It is a persuasive and impelling force rather than an arbitrary and coercive one, and is motivated by deep-seated sincerity, integrity, kindliness, and tolerance. It cannot fail to make one who practices it a more valuable social being in the strife-torn world.

The purpose of this paper is to describe some of the characteristics of good leadership which industry has discovered in the process of training its own executives. Roughly, we can divide leadership into two parts, one, methods, and the other, relationships with subordinates. Two of the principal divisions under methods might be termed methods of praise and criticism and methods of direction.

Methods of praise and criticism are important because it is in this respect that supervisors most frequently fail in their handling of people. In your thinking about these problems, it is vitally important that you compare the way you like to be handled with the way in which you are handled. This will give you a desirable point of view in the handling of those you supervise. People, as a rule, respond to the same general sort of treatment, because the response engendered is usually emotional and not reasoned. The treatment that I dislike from my superiors is usually exactly the same as the treatment for which my subordinates criticize me. To put it more simply, it is nothing but the Golden Rule: "Do unto others as you would have them do unto you."

Upon reflection you will probably agree that there is more criticism given than praise. This situation tends to encourage a belief on the part of the worker that his supervisor is not fair. Constant criticism without the leaven of properly administered praise leads to discouragement. The worker says, "Is there anything I do right?" and answers his own question, "There are many things that I do right and do well, but my supervisor is not big enough to recognize them."

Well-merited praise should be given as freely as well-founded criticism. But criticism should never be given in the presence of others, nor should either praise or criticism be general. Praise should be given only for specific accomplishment. Criticism should be directed at a specific act. We have found by many surveys that workers frequently say, "A pat on the back is frequently worth more than money in the pay envelope."

It has been determined that criticizing attitude is a mistake. If one criticizes a person's attitude, it tends to disintegrate his person-

ality. Probably no one would argue the statement that most personalities are to some degree disintegrated and that individuals are always struggling, consciously or unconsciously, to achieve better integration. Everyone likes things that flatter him, that build up his good opinion of himself; and everyone is afraid of what hurts him. These feelings are both attempts at personality integration. Criticism of an act does not necessarily hinder integration or promote disintegration of a personality, but in making the criticism it is always advisable to mention something praiseworthy at the same time. In this way the criticism loses its sting but not its force. I know of no kind of situation in which this is not both profitable and desirable.

For example, you might say to a visiting nurse, who is not doing an entirely satisfactory piece of work, "Miss Jones, you have one of the best records in our department for the number of calls which you make each day and for the way in which you handle your patients. But much of this good work is offset by the fact that your reports are prepared in such a manner that it is almost impossible for us to make the proper use of them." From this point, you can develop your criticism more fully. The criticism should close with a word of encouragement and praise. This method will establish in the mind of the worker that you are being fair and have considered her good qualities as well as those about which you are concerned. If the interview is properly developed, she should leave your office more enthusiastic about her job than before, more determined to do a better job, and convinced that she must improve.

In this connection, let me quote you a statement which, I am told, hung in the office of a well-known department store for a long period of time. It is, perhaps, a little too sweeping in its statement; nevertheless the idea is an important one.

> Unless a reproof or criticism is given in such a way as to leave the employee more interested and enthusiastic than before, the exercise of authority has been detrimental to this Company and the person administering it has proven himself unfit to manage men.

In the criticism of conscientious people you must be extremely careful. Always try to put yourself in the other person's position. In the interview, if possible, develop an atmosphere of helpfulness and of the mutuality of the problem involved. For instance, to refer again to the case of the conscientious nurse who was careless about her reports, it would be in accord with this idea for you to say, "I know how much bother these reports are. This is one thing I have to keep constantly schooling myself on, because I do not like to make them out either. But you will agree that they are of great importance; so all of us must give them our best attention and make them out completely and fully."

Another question that has provoked much discussion in conferences considering leadership is, "What is the best time of day to give a subordinate a serious reprimand?" In speaking of "serious reprimand" we mean one that may lead eventually to dismissal of the employee, a final warning. The head of a Baltimore store which is doing a remarkable job on this type of leadership training became so much interested in the question that he asked Dr. Adolph Meyer, the eminent psychiatrist at Johns Hopkins University, this question. Dr. Meyer replied, after some consideration, that he felt the best time to give a criticism of this type was the first thing in the morning. At that time the person administering the reprimand as well as the person receiving it is fresher and more relaxed. This serious blow can then be received with the least permanent damaging effect. However, this is not always possible. This employer said, "I cannot run my store that way. There are too many pressing duties at that time." Dr. Meyer replied, "That is something else. You asked me the best time of day for the individual, and, in my opinion, it is the first thing in the morning."

Other things being equal, we are in agreement that the morning is the best time, but these are other points to be considered: How do you feel? How does the person to be criticized feel? Can the matter wait? What effect will it have on other people? When do you have the time?

In giving criticism it is not necessary to make the person admit his fault. It is not desirable to remind employees of their past errors except in the case of a final warning. Then it might be well to total up the score. It should never be given angrily or with any show of irritation. It should be calm and objective. I have dwelt at considerable length on this matter of criticism, but I think it is of the greatest importance in handling people.

How do you go about encouraging your people? Do you ever let them make errors? Most of the human race learn to some degree through trial and error. Although our best leaders think that this is a desirable situation, certainly no industry could afford to let an employee make a serious error that would cost a large sum of money. Neither could you afford to allow an employee to make an error that might cost lives. But in any job there are many details such that an occasional error in carrying them out is unimportant. Let the worker try his wings. After the error is made, point out how the thinking was faulty and encourage him to try again. Do not stifle the initiative of your people by too close supervision in every small detail. Insofar as possible, let them work in the manner that is the easiest for them so long as the results you require are obtained.

When one of your subordinates comes to you with a suggestion or a plan, follow it as closely as possible. Give him full credit for the

suggestion. Do not be afraid that you will not get credit for your work. Give every credit possible to the subordinate and give it freely and openly. I have known executives who, presented with a plan by a subordinate, would change the plan in some nonessential way and then adopt it as theirs. This is not good leadership. If the plan is good in the main, let it go through as suggested. Later it may be necessary to make some small adjustment. Never be fearful that your subordinates will get credit that is rightfully yours. Be generous to a fault with them on this score. In the long run, you are judged by the results of your department, and you do get the larger and longer range credit.

Do your people ask questions, and do you answer them carefully, completely, exactly, and patiently? Industry has found that the worker asks too few questions, primarily because he does not realize his need for more complete instruction.

Let us discuss briefly the problems raised by the second part of our technique of good leadership, that of the relationship between you and the subordinate. Which type of error is usually more serious for an executive to make in his manner toward his subordinates, being too cold and brusque, or being too free and easy? We believe the more serious error is that of being too cold and brusque. Naturally, it is desirable that an executive maintain a manner of gracious friendliness toward his subordinates. It is better for him to err on the side of being free and easy, as coldness repels rather than attracts.

Above all, an executive must be honest with his subordinates. If you have unjustly criticized a subordinate, good leaders say it is desirable to admit that error. This does not weaken authority. Say frankly, "I did not understand all the problems involved, and find that you were quite right in what you did."

When a subordinate comes to you with a problem that seems serious to him, treat it just as seriously yourself, regardless of how petty or how small it may seem to you. It is advisable in such a case to admit the seriousness of the problem, and then you can point out with consideration those elements in the problem which indicate that it is not of the importance which the employee felt it to be.

Be sure, in laying down rules, that you give reasons for them. When you explain these reasons to your subordinates, show that their point of view has been taken into consideration and that the rule is desirable for other reasons which overbalance this consideration. When an employee understands the reasoning behind rules, he is much more likely to follow them carefully and with greater good will and cheerfulness. In taking over a new piece of work, do not let yourself fall into the error of making radical and rapid changes. Study a new job slowly and as you become familiar with all of its

elements and with people whom you are to supervise, make the necessary changes.

You should also keep in mind that only rarely will you become conscious of dissatisfaction on the part of your staff. The reasons for this are obvious. The only way in which you will know is by developing and practicing the art of good leadership so that your people may be frank and candid with you.

When a new member is added to your staff, take the time and trouble to see that he is well established and that he exactly and fully understands the duties of his job and knows what is expected of him. If duties, responsibilities, the amount of interest required, the exactitude necessary, are carefully described to a new employee, it makes a tremendous impression on him. He cannot help but feel that he is now associated with an organization headed by a sympathetic, understanding, and capable executive.

In industry, it is rarely advisable to mingle socially with one's subordinates outside of business hours. Joking and teasing of subordinates is never permissible. Such actions almost always tend to lower the respect of the individual for his superior. Uniform courtesy at all times is an emphatic rule of those who have executive responsibility, not the cold courtesy of lip service alone, but the courtesy that springs from a genuine interest and a genuine consideration for others.

I hope that the few suggestions I have made on what industry has learned about leadership will start you thinking on the subject. Industry has found leadership to be of great importance, and proficiency in it to be of great value. You will go far toward putting into practice the fundamental principles of good leadership if you will remember the admonitions expressed in these fragments of ancient sayings: "Wisdom is the principal thing; therefore get wisdom, and with all thy getting, get understanding" and "You may destroy a man's gold, his land, and his house, but yet be forgiven. But if you destroy his self-respect, you have destroyed what makes it possible for him to walk among men."

COURT DECISION ON PUBLIC HEALTH

State law for the control of contagious abortion in cattle held valid.—(Virginia Supreme Court of Appeals; *Stickley* v. *Givens, State Veterinarian*, 11 S.E.2d 631; decided November 25, 1940.) A suit was brought by a dairyman against the State Veterinarian of Virginia to enjoin the enforcement of a 1938 Virginia statute (ch. 439) providing for, among other things, the prevention, control, and eradication of Bang's disease. Some of the statute's provisions pertaining to Bang's disease related to the making of the agglutination test and to the condemnation, quarantine, appraisal, and slaughter of cattle found

infected. The plaintiff, as the result of the testing of his cattle for Bang's disease and the subsequent designation of a number of them as infected, challenged the validity of the statute. His contention was that the statute was in violation of the Federal and State constitutions in that it deprived him of his property without due process of law and denied to him the equal protection of the laws. The supreme court of appeals, however, took the view that the challenged act was a reasonable exercise of the police power of the State and that it was not violative of either the Federal or State constitution.

DEATHS DURING WEEK ENDED JANUARY 4, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 4, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,251	9,250
Average for 3 prior years	9,280	10,027
Deaths under 1 year of age	585	566
Average for 3 prior years	560	607
Data from industrial insurance companies:		
Policies in force	64,796,540	66,416,327
Number of death claims	10,108	10,204
Death claims per 1,000 policies in force, annual rate	8.1	8.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 11, 1941

Summary

A total of 89,828 cases of influenza was reported for the current week, as compared with 77,144 for the preceding week. This represents an increase of 12,684 cases, or 16 percent, as against 31,669, or 70 percent, for the prior week. The number of cases for the current week is the largest number reported for any week since December 1932 and the largest number for the comparable week during the past 10 years, or since 1929, when approximately 140,000 cases were reported.

The peak week in the 1928–29 epidemic, with nearly 196,000 cases, was the week ended January 5, while in the 1932–33 epidemic the largest number of cases (90,102) was reported for the week of December 31, 1932.

For the current week, decreases were recorded only for the Mountain and Pacific States. Although all other areas showed increased incidence, the only significant changes were in the South Atlantic region, where the number of cases rose from 4,308 to 13,629, and in the New England States, with 2,563 cases as compared with 149 last week. Three States accounted for most of the increase in the South Atlantic group (Virginia, from 1,752 to 4,200; South Carolina, from 1,581 to 3,686; and Georgia, from 788 to 5,002), while increases in Maine (from 40 to 1,345) and New Hampshire (from 0 to 1,000) accounted principally for the rise in the New England area.

For the week ended January 13, 246 cases of influenza were reported in Alaska.

Of the other 8 communicable diseases reported weekly, measles, poliomyelitis, and whooping cough were above the 5-year (1936–40) median expectancy.

One case of Rocky Mountain spotted fever was reported in Oklahoma, 1 case of undulant fever each in Mississippi and Utah, 1 case of encephalitis each in Maryland and Oklahoma, 2 cases of tularemia in North Carolina and 25 cases of endemic typhus fever, all in the Southern States except 1 case in Ohio and 1 in California.

For the current week the Bureau of the Census reports 9,803 deaths in 88 major cities of the United States, as compared with 9,251 for the preceding week and with a 3-year (1938–40) average of 9,319.

Telegraphic morbidity reports from State health officers for the week ended January 11, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Jan. 11, 1941	Jan. 13, 1940		Jan. 11, 1941	Jan. 13, 1940		Jan. 11, 1941	Jan. 13, 1940		Jan. 11, 1941	Jan. 13, 1940	
NEW ENG.												
Maine	0	4	4	1,345	82	7	70	78	78	0	0	0
New Hampshire	0	0	0	1,000	----	----	3	12	22	0	0	0
Vermont	0	0	0	76	----	----	76	8	11	0	0	0
Massachusetts	1	9	7	----	----	----	509	185	269	4	1	1
Rhode Island	0	0	0	31	----	----	0	226	74	0	1	0
Connecticut	0	0	4	111	3	6	11	161	161	0	1	1
MID. ATL.												
New York	17	25	37	[1]94	[1]13	[1]17	2,135	369	389	2	1	10
New Jersey	3	7	15	30	18	18	876	23	41	2	0	3
Pennsylvania	14	28	39	----	----	----	2,129	50	135	1	9	6
E. NO. CEN.												
Ohio [2]	8	28	34	795	88	14	645	22	70	1	0	6
Indiana	16	14	25	176	25	25	63	7	11	1	1	3
Illinois	12	41	41	37	36	36	1,109	33	48	4	0	7
Michigan [2]	7	11	11	82	15	2	1,775	384	384	1	0	2
Wisconsin	1	2	2	61	48	48	404	221	221	0	0	1
W. NO. CEN.												
Minnesota	1	5	4	3	3	2	2	255	122	0	0	1
Iowa	14	11	6	470	11	5	138	49	34	0	0	1
Missouri	7	14	21	95	18	118	40	5	7	0	0	1
North Dakota	2	0	0	83	42	11	11	1	5	0	0	0
South Dakota	2	5	1	----	13	1	2	6	6	0	0	0
Nebraska	0	4	4	----	----	----	10	8	8	0	1	0
Kansas	2	11	11	3,163	99	32	148	141	18	0	0	1
SO. ATL.												
Delaware	0	0	2	19	----	----	26	1	2	0	0	0
Maryland [2,3]	6	5	8	92	37	24	12	1	98	1	0	0
Dist. of Col.	1	3	10	90	10	2	4	0	7	0	1	1
Virginia	10	25	25	4,200	869	----	198	25	71	5	2	3
West Virginia [3]	8	19	15	430	37	52	61	8	17	0	0	4
North Carolina [2]	22	41	33	40	211	26	94	67	98	2	2	3
South Carolina [2]	5	7	7	8,686	3,948	652	70	3	7	2	1	1
Georgia [2]	16	13	13	5,002	2,192	136	28	26	26	0	0	0
Florida [2]	3	5	9	70	28	11	6	11	11	0	0	2
E. SO. CEN.												
Kentucky	10	19	18	5,950	21	65	241	5	83	1	2	6
Tennessee	7	6	18	4,719	184	184	61	74	67	1	4	4
Alabama [2]	7	15	19	2,201	1,360	352	68	50	50	3	2	5
Mississippi [3]	9	9	8	----	----	----	----	----	----	1	0	1
W. SO. CEN.												
Arkansas	7	18	16	4,664	638	203	30	4	4	1	0	0
Louisiana [2]	4	13	13	4,983	32	36	1	2	23	0	0	1
Oklahoma [4]	6	17	15	2,550	263	183	11	9	13	1	0	0
Texas [2]	32	57	67	33,283	895	716	50	307	216	2	0	2
MOUNTAIN												
Montana	2	1	1	1,065	17	17	7	11	9	0	1	1
Idaho	0	1	2	29	3	8	1	48	48	0	0	0
Wyoming	0	1	1	1,207	24	----	5	9	4	0	0	0
Colorado	5	14	12	1,376	80	21	108	43	28	1	1	1
New Mexico	2	1	8	122	6	6	196	5	29	0	0	1
Arizona	4	2	6	1,118	242	117	101	10	3	0	0	0
Utah [3]	0	0	0	1,564	458	----	12	149	72	0	0	1
Nevada	0	----	----	153	----	----	0	----	----	0	----	----
PACIFIC												
Washington	0	7	1	260	----	1	50	999	141	2	1	0
Oregon	1	7	7	578	274	39	60	141	27	0	0	0
California [2]	10	18	32	2,725	223	86	62	326	326	1	1	3
Total	284	543	676	89,828	12,516	3,018	11,717	4,568	5,203	40	33	106
2 weeks	576	1,031	1,353	166,972	22,146	6,273	19,484	7,451	8,412	68	58	201

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 11, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Jan. 11, 1941	Jan. 13, 1940		Jan. 11, 1941	Jan. 13, 1940		Jan. 11, 1941	Jan. 13, 1940		Jan. 11, 1941	Jan. 13, 1940	
NEW ENG.												
Maine	0	0	0	5	26	16	0	0	0	1	0	0
New Hampshire	0	0	0	3	0	8	0	0	0	0	0	0
Vermont	0	0	0	15	5	6	0	0	0	0	0	0
Massachusetts	0	0	0	136	128	260	0	0	0	1	0	2
Rhode Island	0	0	0	4	4	26	0	0	0	0	0	0
Connecticut	0	0	0	27	72	77	0	0	0	2	0	0
MID. ATL.												
New York	4	1	0	316	419	564	0	0	0	9	9	8
New Jersey	0	1	0	173	224	164	0	0	0	1	2	3
Pennsylvania	1	0	0	268	308	536	0	0	0	4	1	13
E. NO. CEN.												
Ohio [2]	5	1	1	251	354	433	0	1	9	6	4	4
Indiana	3	0	0	101	150	174	5	4	5	2	1	1
Illinois	4	0	0	340	433	548	2	0	14	3	4	4
Michigan [3]	1	1	0	250	321	500	4	1	1	0	2	2
Wisconsin	1	1	1	129	133	288	12	6	6	0	0	0
W. NO. CEN.												
Minnesota	2	1	0	61	124	136	12	13	18	0	1	1
Iowa	0	2	0	54	91	156	4	31	18	1	0	0
Missouri	1	0	0	75	82	193	1	1	19	2	0	1
North Dakota	0	0	0	8	20	35	0	1	12	0	0	0
South Dakota	0	0	0	11	22	26	1	1	5	0	1	0
Nebraska	0	0	0	38	39	44	1	0	3	0	1	1
Kansas	1	0	0	92	135	160	2	1	20	0	0	2
SO. ATL.												
Delaware	0	0	0	13	17	15	0	0	0	0	0	0
Maryland [2] [3]	0	1	0	50	66	66	0	0	0	1	3	2
Dist. of Col.	1	0	0	22	13	22	0	0	0	2	0	1
Virginia	0	2	0	59	54	54	0	1	0	4	2	2
West Virginia [3]	2	1	0	48	66	66	0	0	0	3	3	2
North Carolina [2]	0	3	1	76	84	63	0	0	0	6	3	3
South Carolina [2]	0	0	0	9	17	11	2	0	0	0	3	1
Georgia [2]	2	0	0	24	27	23	0	0	0	4	4	2
Florida [2]	1	0	0	5	11	8	0	0	0	2	0	1
E. SO. CEN.												
Kentucky	2	2	0	86	70	70	0	0	2	1	0	7
Tennessee	1	0	0	57	67	48	0	0	0	1	0	2
Alabama [2]	0	1	1	26	41	24	0	0	0	1	1	2
Mississippi [3]	0	0	0	10	13	10	0	0	0	1	1	2
W. SO. CEN.												
Arkansas	0	2	1	13	9	18	1	3	3	0	4	2
Louisiana [2]	0	0	0	8	19	18	0	0	1	2	7	7
Oklahoma [4]	2	0	0	39	35	36	0	5	3	2	2	2
Texas [2]	1	4	1	46	61	111	0	2	12	9	12	12
MOUNTAIN												
Montana	1	0	0	16	52	56	0	0	9	0	0	0
Idaho	0	1	1	25	12	19	0	0	14	0	0	0
Wyoming	1	0	0	2	5	10	0	0	1	0	1	0
Colorado	0	0	0	31	27	50	3	33	15	1	1	0
New Mexico	0	0	0	5	14	24	0	1	0	2	0	5
Arizona	0	0	0	2	7	11	0	1	0	2	2	1
Utah [3]	0	1	0	7	24	33	0	1	0	0	0	0
Nevada	0	-----	-----	1	-----	-----	0	-----	-----	1	-----	-----
PACIFIC												
Washington	0	0	0	38	49	56	2	0	8	1	1	2
Oregon	0	0	0	7	23	63	1	3	12	4	1	3
California [3]	0	16	3	129	161	218	0	0	12	7	1	2
Total	37	42	22	3,211	4,134	6,186	53	110	315	89	78	122
2 weeks	101	85	43	5,874	7,731	11,210	93	184	591	159	159	220

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 11, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough, Week ended Jan. 11, 1941	Whooping cough, Week ended Jan. 13, 1940
NEW ENG.		
Maine	23	65
New Hampshire	0	21
Vermont	12	40
Massachusetts	269	152
Rhode Island	14	16
Connecticut	108	87
MID. ATL.		
New York	540	487
New Jersey	164	115
Pennsylvania	651	414
E. NO. CEN.		
Ohio [2]	320	149
Indiana	22	43
Illinois	121	119
Michigan [3]	448	101
Wisconsin	91	101
W. NO. CEN.		
Minnesota	82	72
Iowa	25	9
Missouri	40	3
North Dakota	14	13
South Dakota	2	4
Nebraska	2	1
Kansas	72	36
SO. ATL.		
Delaware	20	3
Maryland [2,3]	92	80
Dist. of Col	10	5
Virginia	151	29
West Virginia [3]	42	11
North Carolina [2]	327	39

Division and State	Whooping cough, Week ended Jan. 11, 1941	Whooping cough, Week ended Jan. 13, 1940
SO. ATL.—continued		
South Carolina [2]	75	10
Georgia [2]	10	14
Florida [2]	11	7
E. SO. CEN.		
Kentucky	74	0
Tennessee	33	17
Alabama [2]	42	13
Mississippi [3]	-------	-------
W. SO. CEN.		
Arkansas	24	3
Louisiana [2]	8	2
Oklahoma [4]	12	0
Texas [2]	232	94
MOUNTAIN		
Montana	6	3
Idaho	8	6
Wyoming	9	6
Colorado	28	15
New Mexico	22	14
Arizona	26	37
Utah [3]	34	79
Nevada	0	-------
PACIFIC		
Washington	45	49
Oregon	5	27
California [2]	410	183
Total	4,776	2,794
2 weeks	8,102	4,871

[1] New York City only.
[2] Typhus fever, week ended Jan. 11, 1941, 25 cases as follows: Ohio, 1; Maryland, 1; North Carolina, 3; South Carolina, 5; Georgia, 6; Florida, 2; Alabama, 1; Louisiana, 1; Texas, 4; California, 1.
[3] Period ended earlier than Saturday.
[4] Rocky Mountain spotted fever, week ended January 11, 1941, Oklahoma, 1 case.

279832°—41——9

WEEKLY REPORTS FROM CITIES

City reports for week ended December 28, 1940

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	166	529	90	1,295	826	1,864	22	346	21	994	-------
Current week [1]	57	4,869	99	2,689	518	830	11	278	18	937	-------
Maine:											
Portland	0	1	0	0	5	2	0	0	0	8	32
New Hampshire:											
Concord	0	------	0	0	1	2	0	0	0	0	10
Manchester	0	------	0	0	3	14	0	0	0	0	23
Nashua	0	------	0	0	0	0	0	0	0	0	6
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	2
Burlington	0	------	0	0	0	1	0	0	0	0	10
Rutland	0	------	0	0	0	0	0	1	0	0	2
Massachusetts:											
Boston	0	------	3	71	19	38	0	11	0	93	210
Fall River	0	------	0	0	0	9	0	1	0	7	38
Springfield	0	------	0	0	0	14	0	1	0	0	30
Worcester	0	------	0	64	6	29	0	4	0	0	60
Rhode Island:											
Pawtucket	0	------	0	0	3	1	0	0	0	0	15
Providence	0	------	0	0	4	1	0	0	0	5	66
Connecticut:											
Bridgeport	0	1	1	1	2	1	0	0	0	1	34
Hartford	0	------	0	1	0	1	0	1	0	5	45
New Haven	0	1	0	1	1	5	0	0	0	7	40
New York:											
Buffalo	0	------	1	40	6	20	0	3	0	25	138
New York	19	32	5	720	55	120	0	51	2	122	1,482
Rochester	0	------	0	2	2	2	0	1	0	12	50
Syracuse	0	------	0	0	2	8	0	1	0	8	43
New Jersey:											
Camden	0	1	0	67	5	4	0	0	0	0	31
Newark	0	------	0	54	5	21	0	4	0	8	119
Trenton	0	------	0	0	1	19	0	1	0	2	22
Pennsylvania:											
Philadelphia	2	7	0	354	13	58	0	17	1	82	465
Pittsburgh	0	------	0	2	18	15	0	9	1	47	175
Reading	0	------	0	74	1	0	0	0	0	5	21
Scranton	0	------	-------	1	-------	0	0	------	0	0	-------
Ohio:											
Cincinnati	1	------	1	10	22	8	0	9	0	9	146
Cleveland	0	22	0	58	8	17	0	4	0	51	207
Columbus	2	3	3	9	7	6	0	2	0	3	79
Toledo	0	1	0	1	2	8	0	7	0	10	86
Indiana:											
Anderson	0	------	0	0	3	1	0	0	0	0	14
Fort Wayne	0	------	0	0	1	6	0	0	0	0	28
Indianapolis	3	------	3	1	7	17	0	1	0	8	122
Muncie	0	------	0	0	5	2	0	0	0	0	13
South Bend	0	------	0	0	6	0	0	0	0	0	26
Terre Haute	0	------	1	1	2	0	0	0	0	0	20
Illinois:											
Alton	0	------	0	0	2	8	0	0	0	0	6
Chicago	11	12	4	516	38	131	0	34	0	74	691
Elgin	0	------	0	1	0	1	0	0	0	0	8
Moline	0	------	0	0	0	1	0	0	0	0	12
Springfield	0	------	0	1	4	5	0	0	0	0	28
Michigan:											
Detroit	0	4	0	473	25	71	7	16	0	82	259
Flint	0	------	0	4	5	1	0	0	0	0	24
Grand Rapids	0	------	0	2	2	3	0	0	0	17	41
Wisconsin:											
Kenosha	0	------	0	0	0	0	0	0	0	0	3
Madison	0	------	0	0	1	5	0	0	0	2	4
Milwaukee	0	------	0	22	0	23	0	1	0	16	122
Racine	0	------	0	1	0	3	0	0	0	0	12
Superior	0	------	0	0	0	3	0	0	0	2	12

[1] Figures for Wilmington, N. C., and Boise estimated; reports not received.

City reports for week ended December 28, 1940—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	-----	0	0	1	1	3	0	0	6	24
Minneapolis	0	-----	1	2	1	15	0	2	0	5	113
St. Paul	0	-----	0	0	3	3	0	1	0	20	72
Iowa:											
Cedar Rapids	0	-----	-----	0	-----	0	0	-----	0	0	-----
Davenport	0	-----	-----	1	-----	1	0	-----	0	0	-----
Des Moines	0	-----	0	2	0	5	0	0	0	0	31
Sioux City	0	-----	-----	0	-----	11	0	-----	1	3	-----
Waterloo	0	-----	-----	0	-----	3	0	-----	0	1	-----
Missouri:											
Kansas City	0	3	0	3	16	6	0	2	0	6	108
St. Joseph	0	-----	0	0	11	3	0	0	0	0	23
St. Louis	4	5	0	0	20	26	0	7	1	5	274
North Dakota:											
Fargo	1	11	0	0	0	2	0	0	0	6	5
Grand Forks	0	-----	-----	0	-----	0	0	-----	0	0	-----
Minot	0	-----	0	0	0	0	0	0	0	0	7
South Dakota:											
Aberdeen	0	-----	-----	0	-----	4	0	-----	0	1	-----
Sioux Falls	0	-----	0	0	0	2	0	0	0	0	7
Nebraska:											
Lincoln	1	-----	-----	1	-----	5	0	-----	0	2	-----
Omaha	0	-----	0	0	2	2	0	0	0	2	47
Kansas:											
Lawrence	0	-----	0	6	1	0	0	0	0	0	8
Topeka	0	2	0	2	3	2	0	0	0	2	25
Wichita	0	144	0	0	4	0	0	0	1	12	32
Delaware:											
Wilmington	0	-----	0	4	6	0	0	0	0	2	30
Maryland:											
Baltimore	1	3	0	3	12	20	0	5	0	49	217
Cumberland	0	-----	0	0	1	0	0	0	0	0	9
Frederick	0	-----	0	0	0	0	0	0	0	0	9
Dist. of Col.:											
Washington	0	6	0	5	16	16	0	9	0	16	207
Virginia:											
Lynchburg	0	-----	0	0	2	0	0	0	0	0	10
Norfolk	0	25	0	2	5	1	0	0	0	1	30
Richmond	1	-----	1	1	2	6	0	3	1	0	61
Roanoke	0	-----	0	19	2	4	0	2	0	5	22
West Virginia:											
Charleston	0	3	0	0	0	0	0	1	0	0	12
Huntington	0	-----	-----	0	-----	1	0	-----	0	1	-----
Wheeling	0	-----	0	0	2	0	0	0	0	7	16
North Carolina:											
Gastonia	0	-----	-----	0	-----	0	0	-----	0	1	-----
Raleigh	0	-----	0	0	0	2	0	0	0	4	1
Wilmington	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Winston-Salem	1	-----	0	0	2	0	0	0	0	10	31
South Carolina:											
Charleston	0	18	0	15	3	1	0	0	0	3	23
Florence	0	12	0	8	0	0	0	0	0	2	2
Greenville	0	-----	0	1	3	1	0	0	0	0	22
Georgia:											
Atlanta	0	49	0	0	4	10	0	8	0	1	86
Brunswick	1	-----	0	0	0	0	0	0	0	0	6
Savannah	0	18	2	4	2	2	0	0	0	1	29
Florida:											
Miami	2	5	2	0	1	0	0	1	1	0	35
Tampa	0	-----	0	0	1	0	0	0	0	0	23
Kentucky:											
Ashland	0	7	0	0	0	0	0	0	0	1	4
Covington	0	-----	0	3	2	1	0	0	0	0	12
Lexington	0	-----	0	66	4	0	0	2	0	13	16
Tennessee:											
Knoxville	2	3	0	0	4	4	0	0	0	4	32
Memphis	0	29	0	13	3	6	0	2	0	7	63
Nashville	0	-----	2	0	2	3	0	1	0	3	42
Alabama:											
Birmingham	0	3	0	15	3	2	0	2	0	0	52
Mobile	0	71	4	1	2	1	0	2	1	0	36
Montgomery	0	-----	-----	0	-----	3	0	-----	0	0	-----
Arkansas:											
Fort Smith	0	304	-----	0	-----	1	0	-----	0	0	-----
Little Rock	0	56	0	1	2	0	0	0	0	3	16

City reports for week ended December 28, 1940—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Louisiana:											
Lake Charles	0	------	1	0	1	0	0	1	0	0	--------
New Orleans	1	45	3	0	20	1	0	10	0	1	155
Shreveport	0	645	0	0	2	0	0	3	2	0	20
Oklahoma:											
Oklahoma City	2	43	0	0	4	6	0	0	0	0	37
Tulsa	0	------	1	1	1	2	0	1	0	0	8
Texas:											
Dallas	4	15	3	0	5	0	0	0	0	0	86
Fort Worth	0	------	1	2	7	3	0	3	0	0	50
Galveston	0	------	0	1	4	0	0	3	0	0	21
Houston	1	691	0	0	5	3	0	4	1	0	83
San Antonio	1	181	14	1	14	0	0	6	0	0	110
Montana:											
Billings	0	------	0	0	3	1	0	0	0	0	10
Great Falls	0	11	0	0	2	1	0	0	0	0	13
Helena	0	80	0	0	0	0	0	0	0	0	7
Missoula	0	86	0	0	2	0	0	1	0	0	10
Idaho:											
Boise	------	------	------	------	------	------	------	------	------	------	------
Colorado:											
Colorado Springs	0	------	0	2	1	0	0	1	0	0	12
Denver	1	405	2	26	8	9	1	4	0	8	84
Pueblo	0	------	0	15	1	1	0	0	1	1	8
New Mexico:											
Albuquerque	0	11	0	0	2	0	0	1	0	0	11
Utah:											
Salt Lake City	0	------	4	1	4	0	0	1	0	3	59
Washington:											
Seattle	0	------	7	1	5	2	0	2	0	7	113
Spokane	0	219	7	0	4	3	0	0	0	0	71
Tacoma	0	------	7	2	2	0	0	1	0	4	58
Oregon:											
Portland	3	407	1	1	6	1	0	0	0	2	105
California:											
Los Angeles	1	1,519	13	2	16	14	0	14	1	26	372
Sacramento	1	96	3	0	9	2	0	2	0	0	46
San Francisco	0	371	4	1	7	1	0	8	0	13	187

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Connecticut:			
Bridgeport	1	0	0
New York:			
New York	1	0	0
Pennsylvania:			
Philadelphia	1	0	0
Ohio:			
Cincinnati	0	0	1
Cleveland	0	0	1
Indiana:			
Indianapolis	0	0	1
Illinois:			
Springfield	0	0	1
Michigan:			
Detroit	1	0	0
Wisconsin:			
Milwaukee	0	0	1
North Dakota:			
Fargo	1	0	0
Maryland:			
Baltimore	1	1	0
District of Columbia:			
Washington	0	1	0
Virginia:			
Norfolk	1	0	0
Louisiana:			
Shreveport	0	1	0
Washington:			
Seattle	0	0	1

Encephalitis, epidemic or lethargic.—Cases: New York, 2.

Pellagra.—Cases: Charleston, S. C., 1; Atlanta, 2; Savannah, 1; Birmingham, 1.

Typhus fever.—Cases: Atlanta, 2; Savannah, 1; Miami, 1; Mobile, 2; Montgomery, 2; New Orleans, 1; Los Angeles, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 7, 1940.—During the week ended December 7, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		2	1	1	7	1		2	2	16
Chickenpox		19		227	534	63	57	128	135	1,163
Diphtheria		34	2	69	8	9	3	2		122
Dysentery				4						4
Influenza		223			87	43			899	1,252
Measles		197	3	122	254	135	103	61	164	1,039
Mumps				87	100	13	6	7	5	218
Pneumonia		3			14	1	3	1	9	31
Poliomyelitis				2	3		2			7
Scarlet fever		21	5	114	102	10	10	15	82	309
Tuberculosis	1	9	9	34	43	2	8	5		111
Typhoid and paratyphoid fever			1	16	1				6	24
Whooping cough		3		166	156	19	24	18	15	396

Vital statistics—Second quarter 1940.—The Bureau of Statistics of Canada has published the following preliminary statistics for the second quarter of 1940. The rates are computed on an annual basis. There were 21.5 live births per 1,000 population during the second quarter of 1940 as compared with 21.3 during the second quarter of 1939. The death rate was 9.4 per 1,000 population for the second quarter of 1940 and 9.9 for the second quarter of 1939. The infant mortality rate was 56 per 1,000 live births in this quarter as compared with 60 for the same quarter of 1939. The maternal death rate was 3.7 per 1,000 live births for the second quarter of 1940 and 4.7 for the same quarter of 1939.

The accompanying tables give the numbers of births, deaths, and marriages, by Provinces, for the second quarter of 1940 and deaths by causes in Canada for the second quarter of 1940 and the corresponding quarter of 1939.

Number of births, deaths, and marriages, second quarter 1940

Province	Live births	Deaths (exclusive of still-births)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada [1]	61,157	26,778	3,448	229	30,988
Prince Edward Island	544	253	34	3	128
Nova Scotia	3,164	1,367	176	6	1,530
New Brunswick	3,028	1,217	225	15	1,062
Quebec	21,467	8,132	1,530	88	9,510
Ontario	17,325	9,227	730	58	10,936
Manitoba	3,648	1,545	183	16	2,120
Saskatchewan	4,543	1,536	242	10	1,709
Alberta	4,024	1,544	206	21	1,681
British Columbia	3,414	1,957	122	12	2,312

[1] Exclusive of Yukon and the Northwest Territories.

Deaths, by cause, second quarter 1940

Cause of death	Canada [1] (second quarter)		Province								
	1939	1940	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Automobile accidents	314	331	1	17	23	83	148	15	14	10	20
Cancer	3,095	3,200	26	196	128	900	1,200	182	180	196	282
Cerebral hemorrhage, cerebral embolism, and thrombosis	525	549	12	37	44	111	214	33	35	31	32
Diarrhea and enteritis	454	387	2	7	15	228	68	19	25	16	7
Diphtheria	63	35			2	21	3	5		3	1
Diseases of the arteries	2,800	2,770	23	136	95	534	1,355	152	149	130	196
Diseases of the heart	4,747	4,858	36	199	180	1,169	2,035	303	255	259	422
Homicides	28	36				4	14	2	7	7	2
Influenza	1,209	534	9	33	12	205	115	35	54	55	16
Measles	75	42		2		18	11	8	1	2	
Nephritis	1,726	1,700	16	82	59	797	476	52	72	60	86
Pneumonia	1,596	1,452	15	90	96	423	453	89	104	99	83
Poliomyelitis	12	4	1				1	2			
Puerperal causes	280	229	3	6	15	88	58	16	10	21	12
Scarlet fever	41	31			1	19	8	1		2	
Suicides	297	298	2	4	6	46	117	16	29	27	51
Tuberculosis	1,682	1,527	13	100	85	676	271	102	61	81	138
Typhoid fever	47	58		1	7	30	5	8	7		
Other violent deaths	1,039	1,010	5	57	38	220	399	54	55	76	106
Other specified causes		7,350	86	377	306	2,451	2,246	433	461	438	492
Unspecified or ill-defined causes		163	3	14	31	56	20	7	6	19	7
Whooping cough	118	124		9	14	53	10	11	11	12	4

[1] Exclusive of Yukon and the Northwest Territories.

JAMAICA

Communicable diseases—4 weeks ended December 21, 1940.—During the 4 weeks ended December 21, 1940, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	3	19	Leprosy		6
Diphtheria	3	1	Puerperal sepsis		5
Dysentery	14	10	Tuberculosis	22	77
Erysipelas	1	9	Typhoid fever	6	34

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of December 27, 1940, pages 2408–2412. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Union of South Africa—Orange Free State—Bothaville District.—During the week ended November 16, 1940, 6 deaths from pneumonic plague were reported in Bothaville District, Orange Free State, Union of South Africa.

Public Health Reports

VOLUME 56 JANUARY 24, 1941 NUMBER 4

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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A STUDY OF THE EFFECT OF LEAD ARSENATE EXPOSURE ON ORCHARDISTS AND ON CONSUMERS OF SPRAYED FRUIT [1]

The manuscript of a Public Health Bulletin presenting the results of recent field work and laboratory work conducted by the Division of Industrial Hygiene of the National Institute of Health has been approved for publication.

This investigation comprises a study extending over three years of the possible injury to health of people exposed to lead arsenate, whether by ingestion on fruit (consumers), by inhalation of spray mist or dust (orchardists), or by other forms of exposure. It has included both an intensive field study of large groups of men, women, and children, as well as toxicological laboratory investigations of the effect of lead arsenate upon man and animals, and of similarly related problems. The possibility that lead arsenate could have been a factor, directly or indirectly, in other diseases was studied.

This bulletin reports the results of an epidemiologic study based on field operations extending over a 14-month period of 1,231 men, women, and children who live in an apple-growing region where large quantities of lead arsenate have been used for many years as insecticide sprays. Toxicologic studies of the effect of lead arsenate on man and laboratory animals are being published separately.

These 1,231 persons may be discussed conveniently in terms of classifications based on their exposure to lead arsenate. There were 488 male orchardists and 54 women, who, because of full-time or part-time work tending tanks, were classified as female orchardists.

Only six men and one woman had a *combination* of clinical and laboratory findings directly referable to the absorption of lead arsenate. Some physicians may interpret these cases as minimal lead arsenate intoxication. However, as regards lead, these cases do not come up to the criteria of the Committee on Lead Poisoning of the American Public Health Association for lead intoxication, incipient plumbism, or lead poisoning. These subjects were all orchardists and ranged in age from 23 to 68 years.

[1] Neal, Paul A., Dreessen, Waldemar, C., Edwards, Thomas I., Reinhart, Warren H., Webster, Stewart H., Castberg, Harold T., and Fairhall, Lawrence T. A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. Public Health Bulletin No. 267. In press. The text of this announcement is the complete summary of the bulletin.

None of the other persons included in the study had a combination of clinical and laboratory effects directly attributable to lead arsenate absorption. These include: 95 men and 145 women classified as consumers who had no occupational exposure to lead arsenate or to any other lead or arsenic compound; 158 men and 171 women, former orchardists or seasonal workers in apple-packing sheds, who were intermediate in exposure between the two foregoing groups; and 99 boys and girls under 15 years of age.

In the region in which these persons lived and worked, lead arsenate has been used for codling moth control since about 1900. During the 1938 season, as many as 10 cover sprays were applied in apple orchards, usually 3 pounds of lead arsenate per 100 gallons of water and from 40 to 50 gallons of spray per tree per cover. Mixing spray materials involves an average exposure of 57.4 mg. of lead per 10 cubic meters of air and 18.5 mg. of arsenic per 10 cubic meters of air (as lead arsenate). Spraying, which may be a full-time or part-time activity, exposed orchardists to an average atmospheric concentration of 4.5 mg. of lead per 10 cubic meters of air and 1.4 mg. of arsenic per 10 cubic meters of air. Other orchard activities tabulated and discussed involved measurable atmospheric lead and arsenic exposures as a result of dispersing spray residues adhering to leaves, branches, and fruit.

Measurable amounts of lead and arsenic were found, almost without exception, in the urine of consumers who reported eating no apples at all. This finding receives corroboration in analyses made by the same chemists on the urine of 28 men and 18 children who live in a suburban community near Washington, D. C., and who have no exceptional sources of exposure to lead and arsenic. These findings are consistent with recent reports in the literature of the widespread distribution of small amounts of lead and arsenic as natural constituents of food products and with published information on the lead content of drinking water and of the air in urban communities.

In an effort to investigate even minimal effects of lead arsenate exposure, the population, particularly consumers, was classified by the number of apples they reported eating annually. Separate systems of classification were set up for persons who reported eating commercially-washed apples almost exclusively, for persons who ate unwashed apples almost exclusively, and for persons who ate both washed and unwashed apples. Chemical analyses of unwashed apples of the kind eaten by residents of the district showed that the spray residue load averaged about 20 times the amount found on apples shipped in interstate commerce.

Clinical and laboratory data for 95 men and 145 women classified as consumers were analyzed in such a way as to trace the effects of the *increment* in lead and arsenate intake superadded to the usual

dietary and atmospheric sources of lead and arsenic. The additional amounts of these elements ingested as lead arsenate on sprayed apples and pears raised the concentration of lead in the blood of male and female consumers to an extent which is more conveniently expressed in micrograms than in milligrams, and also resulted in raising the concentration of lead and arsenic in the urine. For statistical reasons (asymmetrical distribution of urinary lead and urinary arsenic values) the latter two findings cannot be studied as closely as blood lead concentration. These additional amounts of lead arsenate ingested as spray residue were not accompanied by any effects on blood findings (hemoglobin content, erythrocyte count, or reticulocyte percentage) or on the occurrence of any clinical findings, whether considered separately or in association.

The medical records of men and women were sorted by a procedure designed to select all the case records in which lead arsenate intoxication needed to be considered in differential diagnosis. Case records in which symptoms, clinical findings, and laboratory findings are satisfactorily accounted for by diagnoses of common diseases are presented in abridged form; cases which presented problems in differential diagnosis are described in full; and the 7 cases which had a combination of clinical and laboratory findings directly referable to lead arsenate absorption are discussed in detail.

Although sprayers who apply lead arsenate sprays intermittently did not appear to be adversely affected, consideration should be given to the protection of the health of men who mix or apply lead arsenate sprays every working day of the season.

Special attention was given to medical examination of children because, in this district where orchards surround the communities or the houses in which they live, there are unusual opportunities for children to be exposed to lead arsenate insecticide sprays and spray residues on branches, leaves, and grass, in addition to the lead arsenate spray residues they ingest on apples. There was only one respect in which these children may have differed from children in other districts; their urinary lead and urinary arsenic values were higher than the corresponding values for a group of 18 children living near Washington, D. C., known to have no unusual exposure to lead or arsenic. There was no indication of adverse effects of lead arsenate exposure on the health of these children.

The prevalence of other diseases, such as heart diseases, pulmonary tuberculosis, and neoplastic diseases, has been tabulated and discussed. Each type of illness was studied to find out whether its occurrence or course had been modified by lead arsenate exposure. Insofar as comparative data for other populations are available, no evidence was found that any of these forms of ill health was more

prevalent in this region than elsewhere, or that any cases of chronic diseases had been caused or influenced by lead arsenate exposure.

There was no indication obtainable from the marital histories of men and women examined at the field office of any effect on fertility attributable to lead arsenate exposure.

CANCER IN THE MENTALLY ILL [1]

By SIGISMUND PELLER, *Research Associate, New York University*, and CHARLES S. STEPHENSON, *Commander, Medical Corps, United States Navy, in charge, Division of Preventive Medicine, Bureau of Medicine and Surgery, Navy Department*

The frequency of tuberculosis as well as of heart diseases in mental hospitals has been frequently discussed. Little material dealing with cancer in mental hospital populations has been published. There are many more contributions to the problem of mental disease in cancer patients than to the forms and frequency of cancer among the mentally ill.

During the years 1930–39 there were admitted to St. Elizabeths Hospital, Washington, D. C., 9,503 patients. During the same period 4,529 patients were discharged and 2,665 died. The period of residence among all those who died ranges from a few weeks to almost 50 years. On the average 5,395 patients were on the rolls. During the 10 years under consideration, 227 cases of cancer among the patients were discovered, 119 among males and 108 among females. Of these patients 189 died in the hospital, 7 were discharged, and 31 were still alive on December 31, 1939. Of the 227 cancer patients, 69 were colored. In 155 of the cancer deaths a post-mortem examination was done.

TABLE 1.—*Deaths from all causes, and deaths from cancer, St. Elizabeths Hospital, 1930–39*

	Deaths	Examined post mortem	Not examined
All deaths	2,665	1,873	792
Deaths of cancer patients	189	155	34
Percentage of deaths from cancer	7.1	8.3	4.3

All forms of cancer which might be expected in such a sample, that is, carcinoma, sarcoma, hypernephroma, and malignant endothelioma, are represented among these 227 cases.

[1] From St. Elizabeths Hospital, Washington, D. C., the Department of Anatomy, Graduate School, New York University, New York City, and the Division of Preventive Medicine, Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

The opinion or assertions contained herein are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

The female reproductive organs, the genital tract and breast, prove the most frequent site of cancer. In male mental patients the percentage of stomach cancers is higher in the colored than in the white patients. The proportion of genito-breast cancers to all other malignancies in female mental patients does not differ materially from that in the general population. In two groups of female patients, however, those under 50 years of age,[2] and those suffering with senile dementia, the proportion is different. In the 23 women under 50 years of age who developed cancer, the primary tumor appeared 19 times (i. e., in 82.6 ± 7.9 percent) in the genital organs or breast. This is higher than the ratio among the general population. Of the 30 women with senile dementia who had cancer, the primary tumor occurred 9 times (i. e., in 30.0 ± 8.3 percent) in the genital organs. Age alone does not explain this low percentage. Among 78 cancer cases with all types of psychosis except senile dementia, the genito-breast organs were affected in 43 cases (55.8 ± 5.6 percent). This is a high proportion.

In cancer of the upper alimentary tract, the ratio of cases among male mental patients is higher (43 percent instead of about 33 percent) and among female patients only slightly higher (19 instead of 15 to 16 percent) than among the general population. On the other hand, the ratio of cases of the digestive organs below the pylorus is low in both sexes.

METASTASES

In 15 out of 94 male cancer patients and in 11 out of 61 female patients examined post mortem, no metastases were found. One of these cases, a white woman, 44 years of age, the mother of 2 children, was admitted to St. Elizabeths Hospital in 1899. Twenty-eight years later, in 1927, the patient developed an ulcerated breast tumor, regarded then as inoperable. Daily dressing was ordered and continued throughout the intervening years. The tumor grew slowly and remained ulcerated throughout the patient's life. Ten years later, in 1937, the patient died suddenly of a spontaneous rupture of the heart and thrombosis of the coronary arteries. At the autopsy no metastases of the histologically verified adenocarcinoma of the breast were found; the cells themselves did not show mitotic figures.

As usual, secondary involvement was most frequent in the lymph glands and in the liver. The liver was secondarily involved in 61 cases (41 male and 20 female). The next sites in order of frequency were the lungs (15 cases in males and 14 in females); bones (18 cases); and the brain, peritoneum, adrenals, pleura, and kidneys.

[2] There were 23 females in this group.

TABLE 2.—*Distribution of primary tumors by site, sex, age, and race* [1]

Age (years)	Sex	Skin	Lip	Mouth, inner nose, pharynx	Esophagus	Stomach	Intestines	Gall bladder, liver	Kidney	Bladder, prostate	Uterus, vagina	Vulva	Ovary	Breast	Lung, larynx	Bones	Thyroid	Adrenals	Thymus	Pancreas	Lymphosarcoma, endothelioma	Eye	Other and primary undetermined	Total
White patients:																								
20-44	Male	2(2)	3(3)			1	2			2					1						1			12 (5)
	Female						1				2(1)			3(3)										6 (4)
45-64	Male	4(1)	3(3)		2	10	5	2		5					2			2		1	1	1		38 (7)
	Female	7(4)	1(1)			3	2	1			8(2)	2(1)	2(1)	5(2)	1						1			33(11)
Over 65	Male	1		4(2)	3	12	6	1		6					3								3	39 (2)
	Female	2(2)		1	1	4	3	2	1	2	4		1	6(1)			1			2				30 (3)
Age unknown	Female										1(1)													1 (1)
Colored patients:																								
20-44	Male				1																			1
	Female										4(2)	1(1)		1										6 (3)
45-64	Male				1	8		1		1					1	2								14
	Female					3				1	3			4(1)		1				2	1			15 (1)
Over 65	Male	1				6		1		1					3			1	1			1(1)		15 (1)
	Female				1	2	4			2		1	1	3							1		1	17
Total		17(12)	7(7)	5(2)	9	49	23	8	1	20	22(6)	4(2)	4(1)	22(7)	11	3	1	3	1	5	5	2(1)	4	227(38)

[1] The figures in parentheses indicate living cases. These cases are included in the total of 227. Second and third primary tumors are not included in the table.

In St. Elizabeths Hospital special attention has been paid to the dissected brain. The chief sources of the intracranial metastases are malignancies of the lungs, the prostate, and the adrenals. Out of 8 cases of lung cancer, 5 sent metastases to the intracranial space; out of 7 cases of prostate cancer, 5 sent secondary deposits to the intracranial space; while 2 out of 3 cases of adrenal carcinoma had intracranial metastases. Of the 18 persons who died of cancer of one of the three mentioned organs, post-mortem examination revealed that 12, or 66.6 percent, had a secondary growth in either the brain or hypophysis, or in the meninges. Of the remaining 137 cases, 14, or 10.2 ± 2.5 percent, developed such metastases. Altogether, brain metastases, except those of the hypophysis, were found in 15 post-mortem examinations. In 8 of these 15 cases the primary tumor originated in either the lung (4), prostate (2), or adrenals (2). Thus, in cases of lung,[3] prostate, or adrenal cancer, brain metastases were encountered in 44.4 percent, while the corresponding figure for the remaining 137 autopsied cases is 5.1 ± 1.8 percent. The hypophysis showed secondary involvement in 3 male patients (prostate cancers) and in 2 female patients. One of the latter cases was an epithelioma of the eyelid, while in the second case the colon was primarily affected.

Of the 7 cases of malignancy of the prostate which were examined post mortem, 6 were carcinomas and one was a rare case of spindle-cell sarcoma. The 6 carcinomas metastasized, 3 of them into the hypophysis. One of the 3 other patients did not develop metastases in the hypophysis but suffered simultaneously from carcinoma of the prostate and from a primary carcinoma of the hypophysis. This patient had 3 primary tumors simultaneously—a large fibrosarcoma on the back, without metastases, associated with a microscopically small adenocarcinoma of the prostate presenting large metastases to the heart, lungs, mediastinal lymph nodes, and to the arachnoid. The third primary tumor in this patient was an early carcinoma of the hypophysis, different in its structure from the other 2 tumors, and without metastases.[4]

[3] In cases of lung cancer brain metastases were more frequent than observed in the literature (*Cf.* Hare, C., and Schwarz, G. A.: Arch. Int. Med., **64**: 542 (1939); Bloch, R. G., and Bogardus, G.: Arch. Int. Med., **66**: 395 (1940); Peller, S.: Human Biology, **11**: 130 (1939)).

[4] In our material there was still another case of a primary malignancy of the hypophysis. A 63-year-old white male had miliary adenocarcinoma of the hypophysis without metastases, associated with a melanosarcoma of the choroid metastasizing to the brain, to the orbit, lungs, heart, large intestines, pancreas, kidney, suprarenals, peritoneum, and to the retroperitoneal lymph nodes.

TABLE 3.—*The probability of developing metastases in the different organs*

[Based on 155 post-mortem examinations]

Primary tumor in—	Number of primary tumors	Metastases in—						
		Brain, other than hypophysis	Hypophysis	Leptomeninges	Dura mater	Lung	Liver	Bones
Prostate	7	----	0.43	0.29	0.29	0.29	0.14	0.29
Lungs	8	0.62	----	.25	.12	----	.75	.50
Stomach	40	.02	----	.02	----	.10	.52	----
Breast	9	.11	----	----	.11	.33	.22	.22
Female genital organs	16	----	----	----	----	.31	.19	.12
Adrenals	3	.66	----	----	----	.33	.33	.66
Other organs	72	.03	----	.01	----	.19	.36	.08
Total	155	.09	.02	.04	.03	.19	.39	.12

NUMBER OF MULTIPLE PRIMARY TUMORS

Altogether there were 5 cases of synchronous multiple cancers. Two of them have been mentioned. The other 3 cases were: (1) A 68-year-old white male with adenocarcinoma of the stomach associated with a primary adenocarcinoma of the sigmoid; (2) an 86-year-old white male with adenocarcinoma of the stomach and a tumor, a "probable" fibrosarcoma of the dura, neither of them metastasizing; (3) a 68-year-old white female with a metastasizing adenocarcinoma of the sigmoid associated with a small (25 mm.) hypernephroma of the left kidney, without metastases. Among the colored patients there were 2 cases of primary multiplicity, myeloma and multiple hepatoma.

In the series of 155 cases examined post mortem there was 1 case of a doubtful metachronous multiplicity in a white female, 52 years of age, admitted to the hospital in 1920. On admission a scar (from an incised furuncle) was noticed on the left breast. In 1927 a cystectomy and oophorectomy were done. The histological diagnosis was fibrosarcoma with hemorrhage. In 1930 a secondary oophorectomy was done. No malignancy or secondary tumors were found. In June 1932 an ulcer developed in the previously mentioned scar on the left breast. The histological diagnosis was carcinoma. The patient died in October 1937. The post-mortem diagnosis was primary scirrhous carcinoma of the breast with metastases to the lung, pleura, and ribs. The reexamination of the section of the ovary, however, "throws considerable doubt upon the original diagnosis of fibrous sarcoma. It now appears much more like an ordinary ovary which is very much swollen up due to a large quantity of blood present. No malignant cells are found, the tissue is disorganized, it is true, but this is probably part of the original pathological process."

In how many of the allegedly metachronous cancers would a careful reexamination of the first primary tumor lead to similar conclusions?

PERCENTAGE OF CANCER DEATHS IN MENTAL PATIENTS

Of the 2,665 deaths at St. Elizabeths Hospital during the years 1930–39, 189, or 7.1 ± 0.5 percent, were attributed to cancer. This is a low ratio, although it is higher than that given by Warren and Canavan [5] for Massachusetts mental hospitals, where, at post-mortem examination, 4.3 percent of all *sudden and unexpected deaths* were found to be due to cancer. In conformity with other authors Warren and Canavan conclude that patients in mental hospitals suffer considerably less from cancer than the general population of the same age distribution. This conclusion is unwarranted.

The cancer frequency and cancer ratio in an institution depend on many factors. The higher the percentage of discharges after a short time in the hospital the less accurate become the cancer statistics. Of the white patients in St. Elizabeths Hospital on January 1, 1940, 13.4 percent of the male and 14.3 percent of the female patients had been admitted during the year 1939; 25.1 percent and 31.6 percent, respectively, had been residents from 1 to 5 years; and 61.5 percent and 54.1 percent, respectively, had been residents for at least 6 years. The average residence in the hospital for white males was 10.3 years; for white females, 9.3 years; and for colored patients, male and female, 9.3 years.

TABLE 4.—*Years of residence of mentally ill patients over 45 years of age at the beginning of 1940, according to age and sex*

Age at time of investigation	White [1]		Colored [2]	
	Male	Female	Male	Female
45–54	13.5	9.9	10.7	10.3
55–64	17.0	14.1	15.8	13.0
65–74	17.9	12.9	14.0	12.3
75 and over	16.7	9.7	12.2	11.0

[1] Calculated on a random sample of 1,170 males and 519 females.
[2] Calculated on a random sample of 182 males and 187 females.

The average age of residents was 47.3 years for white males, 52.1 years for white females, 47.1 years for colored males, and 49.9 years for colored females. Of the male residents, white and colored, 12 percent were 65 years of age or over; of the female residents, 25 percent of the white and 18 percent of the colored were 65 years of age or over. Because of the age of the residents we should expect a much higher cancer ratio than 7.1 percent, which is the percentage recorded in official cancer mortality statistics for the age group 30–34.

The low percentage of cancer deaths is not explained by the practice of discharging patients. Of all the patients discharged there were only seven with a history of cancer. These were symptom-free

[5] New Eng. J. Med., 210:739 (1934).

on the date of discharge. In this group there were four who had a cured skin or lip cancer, one a successfully treated cancer of the vulva, one who had survived three years after mastectomy, and one, the only colored patient among them, had survived 1.5 years following hysterectomy.

A low cancer ratio may result from a high mortality due to other diseases. Of all mentally ill patients, those suffering with general paresis probably show the greatest increase in total mortality. General paresis in St. Elizabeths Hospital accounts for 13 percent of the admissions, as compared with an average of 8.4 percent for mental hospitals in the United States. About 70 percent of the patients admitted to St. Elizabeths Hospital were under 50 years of age. In this age group general paresis accounted for approximately 18 percent of all admissions. During the years 1930–39, 41 cancer patients were observed in the age group under 50 years of whom 8, or 19.5 percent, were also suffering from general paresis. Thus, general paresis patients may have a slightly higher cancer incidence than other mentally ill patients, while the cancer ratio may be lower when compared with the total for the mentally ill. The cancer ratio depends not only on the cancer incidence but also on the total mortality. The ratio of general paresis deaths to total deaths in St. Elizabeths Hospital is higher than the ratio of admissions for general paresis to total admissions. Of the patients under 55 years of age who died during the last 2½ years,[6] 23 ± 3 percent had suffered from general paresis (male, 27 percent, female, 17 percent; white, 21.5 percent; and colored, 24.2 percent). This is considerably greater than the percentage of general paresis among the total admitted. In the age group 55–64 the percentage of general paresis among those who died was 12.8 ± 2.1 percent (male, 15.5 percent; female, 7 percent; white, 11.7 percent; colored, 14 percent). This percentage is nearly as high as the ratio of admissions for general paresis to total admissions, regardless of age.

TABLE 5.—*General paresis and cancer, St. Elizabeths Hospital, 1930–39*

	Sex	Cancer cases			
		White		Colored	
		General paresis	Other psychotics	General paresis	Other psychotics
Under 50 years of age	Male	4	10		4
	Female	2	15	2	4
Over 50 years of age	Male	1	74	3	23
	Female		55		30

[6] Includes the first half of 1940.

TABLE 6.—*Deaths among patients with general paresis and other patients, St. Elizabeths Hospital*

[Unselected sample of 650 consecutive deaths, 1938, 1939, and January to June 1940]

Age at death	Male				Female			
	White		Colored		White		Colored	
	General paresis	Other patients	General paresis	Other patients	General paresis	Other patients	General paresis	Other patients
Under 55	14	48	18	39	6	25	7	39
55–64	8	42	6	34	1	26	2	14
65 and over	2	126	1	46	1	100		41
Age unknown			1	2			1	
Total	24	216	26	121	8	151	10	94

It may be said, therefore, that even today, since the advent of malaria treatment, general paresis patients have a higher total mortality and a somewhat higher cancer mortality than other mental patients. Because the excess in total mortality of general paresis patients is above that of cancer mortality, the cancer ratio is lower than for all mentally ill patients of approximately the same age. However, general paresis patients make up a small group, and are younger than the average psychotic resident. Thus, the low cancer ratio of the general paresis group is not responsible for the low ratio of cancer deaths (7.1 percent) in the whole series.

Since there are, among the 189 cancer deaths, a number of cases representing either mental disease in the course of cancer or at least cases entering the hospital as mentally ill cancer patients, the low cancer ratio is unexpected. Mental disturbance in cancerous persons, due either to cachexia or to psychic shock after operation, is well known.[7] Twenty-one of the 189 deaths from cancer in St. Elizabeths Hospital occurred during the first 3 months of residence. These patients were suffering from cancer prior to admission to the hospital.

The low cancer ratio in our series is either artificial or expresses a low cancer mortality. It is difficult to accept the former explanation when we know that 70 percent of all fatal cases were examined post mortem. There is, however, some explanation for a low cancer incidence and a low cancer ratio in the fact that the majority of our cases were either southern-born or had been living in the South for some time before the mental ailment was discovered. In populations exposed to strong sunlight and to outdoor life the cancer incidence remains approximately the same as among other persons. However, the distribution of the tumors by site differs considerably. Non-

[7] Klippel: Arch. Gen. de Med., 1892; and, more recently, Immerman, S. J.: New York Med. J., 106: 828 (1917).

Cases of mental disorder in cancer have been reported by Ewald, Stertz, Lange, Bonhoeffer, Urechia and Retezanu, Bostroem, Scheps, and others. The frequency of this phenomenon, however, is unknown.

fatal cancers of the skin and lip develop much more frequently among those exposed to strong sun rays, and the number of fatal tumors of the internal organs is about one-half the usual frequency among population groups living in large cities north of 40° latitude.[8] Thus, in the white population of States below 40° latitude the cancer mortality and the cancer ratio are lower than in States north of that latitude. Fifty-two percent of the white patients in St. Elizabeths Hospital were born in the South [9] and 89 percent were either born in the South or were at least residents of the South before admission. A low cancer mortality and a low cancer ratio among all deaths might result from this fact.

GEOGRAPHIC DISTRIBUTION OF WHITE CANCER PATIENTS

In the group of cancer patients we find almost the same percentage of southern-born as are found in the noncancerous population of the hospital. Among the white cancer patients there is only one group of persons (ex-soldiers) in whom the northern-born are more numerous.

TABLE 7.—*Place of birth of white cancer patients at St. Elizabeths Hospital, 1930-39 (north or south of 40° latitude)*

	Patients not connected with the armed forces						Male patients connected at some time with the armed forces		
	Male			Female					
	North	South	Unknown	North	South	Unknown	North	South	Unknown
Still alive [1]	4	[2] 3	1	[3] 7	[4] 10	[5] 2	[6] 2	[7] 3	1
Dead	19	26	1	17	30	3	23	6	-------
Total	23	29	2	24	40	5	25	9	1

[1] For exceptions, see footnotes 2 and 7.
[2] 1 of these 3 patients suffered from a pharynx tumor; 1 from a lip epithelioma (still living); and 1 died 4 years after the lip epithelioma was cured (without signs of cancerous disease at the time of death).
[3] Includes 2 surface epitheliomas.
[4] Includes 4 surface epitheliomas.
[5] Includes 1 surface epithelioma.
[6] Includes 1 parotid tumor.
[7] 2 of these patients are alive and well and 1 died after complete cure of the epithelioma of the eyelid. The post-mortem examination revealed no signs of malignancy.

Table 7 shows a very small number of nonfatal cancer cases. Among the 89 white male patients there were 13 cases of skin and lip cancer, 12 living and 1 dead; and among the 69 white female patients there were 10 cases, 7 of whom are living. It is worthy of note that the records of patients in St. Elizabeths Hospital show an unusually low percentage of histories of skin or lip cancers. According to the experience gained from the studies in the Navy,[10] Army,[11] and at the

[8] Peller, S., and Stephenson, C. S.: Am. J. Med. Sci., 194: 326 (1937); Peller, S., Stephenson, C. S., and Souder, C. G.: Am. J. Hyg., 32: 39 (1940); Mountin, J. W., and Dorn, H. F.: J. Am. Med. Assoc., 113: 2405 (1939).
[9] Calculated on a sample of 1,429 residents at the beginning of 1940.
[10] Peller, S., and Stephenson, C. S.: Am. J. Hyg., 29: 34 (1939).
[11] Peller, S., and Souder, C. G.: Army Med. Bull. No. 51, January 1940.

National Institute of Health,[12] we should expect at least twice as many surface cancers as were observed in this series. This is a conservative estimate. Perhaps there were some surface epitheliomas which developed and were cured prior to admission to this institution. We know of only 2 such cases.

The incompleteness of medical history for the time prior to admission is to be expected in mentally disturbed patients and should not be considered as a reflection on the hospital staff. In view of this observed deficit further exploration of this phase of the problem is indicated.

The recorded experience clearly indicates that persons living in southern climates, thus having a greater exposure to the rays of the sun throughout life, develop surface epitheliomas earlier than those living in northern climates. In the South skin epithelioma is by no means a disease of old people. A considerable portion of the residents is admitted to St. Elizabeths Hospital at an age which renders it very probable that some of them had the epithelioma long before admission. This is especially true for those patients who were living in and near Washington, D. C. At the time of admission they were much older and they were under observation in the hospital for a shorter period of time than were the ex-soldiers, two-thirds of whom were born in northern United States, Canada, or Europe.[13] The ex-soldiers, on the average, came to the hospital at a younger age and remained there for a longer time. Of the 227 cases of cancer, only 2 epitheliomas were reported for the prehospital period and both were in ex-soldiers.

CANCER FREQUENCY

In the years 1930–39 there were 26,514 person-years of observation for white males and 11,772 for white females, 8,532 for colored males, and 7,182 for colored females. The age distribution of the patients at time of admission is shown in table 8. To calculate the number of expected cancer deaths, the age distribution of the residents of the hospital for each one of the 10 years should be known, or at least for the first and the last year of the 10-year period. That would be analogous to the procedure of calculating the age-specific cancer mortality rates for the general population. However, the age distribution of residents was available only for those who were alive at the end of the 10-year period of study. A factor of uncertainty is, therefore, introduced into the calculations which excludes the consideration of small deviations, or small differences, between expected (calculated) and actual figures.

[12] Mountiff and Dorn, op. cit., footnote 8.
[13] Except the southern peninsulas. The percentage of persons born in Europe is considerable among the older mentally ill patients, and, therefore, also among the cancer patients.

TABLE 8.—*Age of white patients at time of admission*

Age in years at time of admission	Percentage of patients who were admitted during 1932, 1935, and 1936		Percentage of patients who were residing in the hospital at the beginning of 1940			
			Men			
	Men [1]	Women [2]	All [3]	Ex-soldiers	Others	Women [4]
Under 34 [5]	49.7	25.6	59.5	[5]74.6	47.2	35.0
35–44	20.6	20.6	19.7	16.5	22.6	23.2
45–54	12.7	14.8	9.7	5.0	13.6	15.9
55–64	9.2	16.1	6.2	2.5	9.2	10.0
65 and over	7.8	22.8	4.8	1.3	7.4	15.9
Total	100	100	100	100	100	100

[1] An unselected sample of 913 men.
[2] An unselected sample of 378 women.
[3] An unselected sample of 989 men.
[4] An unselected sample of 440 women.
[5] 32.1 percent under 24 years of age.

TABLE 9.—*Years of residence in St. Elizabeths Hospital of persons who died from cancer, 1930–39*

Age at death	White males		White females	Colored	
	Ex-soldiers	Others		Males	Females
45–54	19.7	18.5	10.6	11.1	7.6
55–64	21.1	13.6	15.6	15.5	15.6
65 and over	24.2	12.8	12.0	10.6	8.3

The age-specific cancer rates of New York City, for 1935, were applied to the white population of St. Elizabeths Hospital. According to this method, 90.3 deaths among white males and 59.9 deaths among white females from cancer, totaling 150.2 deaths, would be expected. Actually, 75 deaths among males and 50 among females, or 125, were found. Including the death of 1 female, which occurred a few days after the end of the period of observation (January 1940), there would be 126 deaths, or 24 fewer deaths than expected. Seventy percent of all cases were examined post mortem.

There are no reliable official cancer statistics for the colored population. Assuming that the age-specific cancer death rates for colored persons equal those for the white population in New York, we should expect 28.3 deaths among males and 31.5 among females, or a total of 59.8. Actually, 29 deaths among males and 35 among females, or 64, were found.

TABLE 10.—*Age distribution of resident psychotic patients, St. Elizabeths Hospital Jan. 1, 1940*

Age on Jan. 1, 1940	White males		White females [2]	Colored	
	All [1]	Ex-soldiers		Male [3]	Female [4]
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
Under 35	24.3	31.9	17.2	25.1	18.0
35–44	23.9	27.1	18.4	26.9	23.7
45–54	22.6	21.2	19.3	19.4	19.1
55–64	16.8	13.2	19.8	16.7	21.2
65–74	9.2	5.2	15.3	8.3	11.4
75 and over	3.0	1.3	9.6	3.4	6.6
Total	100	100	100	100	100

[1] An unselected sample of 1,170 (520 ex-soldiers).
[2] An unselected sample of 519
[3] An unselected sample of 375.
[4] An unselected sample of 318.

The deficit in cancer deaths among psychotic patients is entirely confined to white persons who had no connection with the Army or Navy. Of the white patients in St. Elizabeths Hospital during the years 1930–39, 11,782 person-years were represented by the group of ex-soldiers. Ex-soldiers on the average were younger than the other white patients. On the basis of age 28.9 cancer deaths would be expected, but 32 deaths were recorded (including the Veterans' Administration patients). This group of patients, therefore, does not have a lower mortality than estimated. Perhaps the small surplus of 3 cases is entirely due to the fact that the Veterans' Administration patients were not included in the total of psychotic ex-soldiers, while all 3 such cases are included in the group of cancerous psychotic ex-soldiers. Excluding ex-soldiers, there remain 14,732 person-years of observation for white male and 11,772 for white female residents. The estimated number of cancer deaths for this group of patients is 62.3 and 59.4 for males and females, respectively, or a total of 121.7 ± 11.0, while actually 43 males and 50 females, or 93 persons, died of cancer. This is 28.7 fewer deaths than expected. The difference is 2.6 times its standard error.

In these calculations no distinction has been made between cancer which developed during residence in St. Elizabeths Hospital and cancer in persons who entered the hospital suffering from cancer. Of the 227 cancer cases observed in the hospital, at least 24 white and 8 colored persons entered the hospital suffering from malignant disease. Some of them were already in the highly cachectic terminal stage and died of cancer within a few weeks following admission. In addition to these 32 cases there were 14 other patients who did not exhibit signs of cancer at the time of admission, but in whom cancer was discovered within 6 months. Five of these 14 patients died before the end of the first year of residence.

In computing the cancer risk of an institutional population, patients entering the institution with manifest symptoms or a history of cancer should be omitted. Those patients who apparently were noncancerous prior to and at the time of admission but died soon thereafter of cancer should also be omitted. Twenty-one mentally ill persons (16 white and 5 colored) died of cancer in St. Elizabeths Hospital within the first 3 months of residence, 8 persons (5 white and 3 colored) died during the second 3 months, 8 died during the second half year following admission, 12 died during the second year, 14 died during the third year, and 126 died during the remaining years of residence. Of the 189 persons who died of cancer during 1930–39, the white patients had lived in St. Elizabeths Hospital an average of 14.9 years and the colored patients an average of 10.5 years.

During the first 6 months after admission 21 [14] white and 8 colored patients died from cancer, or one-sixth of the fatal white cancer cases and one-eighth of the fatal colored cancer cases. Thus, the greatest numbers of cancer deaths in St. Elizabeths Hospital are found during the first and second 3-month periods after admission. In at least one-sixth of the white cancer cases and in one-eighth of the colored cases one should speak of mental disease in admitted cancer patients, regardless of whether the mental disorder developed prior to cancer or in course of the disease. When the cancer risk of an aggregation of mentally ill persons is to be determined, this group of patients is, so to speak, a foreign body in the institution. It would be an error to include these cases in our mortality rates or incidence rates. This error has its analogy in the official mortality statistics of cities, which until now have not succeeded in separating nonresident from resident cancer deaths. In reporting the total number of cancer deaths which occurred these nonresident deaths must be included, whereas in calculating cancer mortality rates of a city as an expression of the cancer risk of the population, they must be omitted. Actually, in city statistics the error introduced is much smaller than it would be in our study. In our series there were 71 white cancer patients who were over 44 years of age at the time of admission. Of these, 16 died within the first 3 months of residence. Seven of the 71 patients had cancer at the time of admission and death occurred at intervals in excess of 3 months. Among the colored mental patients over 44 years of age, there were 5 deaths out of 40 cases, or 12.5 percent. It would be erroneous to include these 28 deaths, which represent 25.2 percent of all malignancies observed in psychotic patients over 44 years of age, in the calculation of the cancer risk of the hospitalized or institutionalized mental population.

[14] Nineteen counted as ill at time of admission.

The cancer risk of the mentally ill, on the basis of 38,286 person-years of observation for white patients and 15,714 person-years for colored patients is, therefore, less than given previously in this study.

TABLE 11.—*Actual and calculated cancer deaths, St. Elizabeths Hospital, 1930–39*

	Observed deaths				
	(a)	(b) Persons who died		(c)	(d)
	Total cancer deaths	In the first 3 months	Later, but were cancerous at time of admission	Observed deaths (a)−(b)	Expected deaths (on basis of white population, New York City, in 1935)
(1) White males:					
(A) Ex-soldiers	32	----------	[1] 2	30 }	28 6±5 4 }
(B) Others	43	9	[2] 1	33 } 101	62 3±7.8 } 150 2±12.2 [4]
(2) White females	50	7	[3] 5	38 }	59.4±7.7 }
(3) Colored males	29	3	----------	26 } 56	28 3 } 59.8±7.7 [4]
(4) Colored females	35	2	3	30 }	31.5 }
Total	189	21	11	157	210 1±14.6

[1] 1 died in the fourth month, 1 in the second half of the first year.
[2] Died in the second half of the first year.
[3] 3 died during the fourth to sixth months, 1 in the second year, and 1 in the fourth year. The latter case became psychotic following hysterectomy.
[4] The standard error of the difference between expectancy and the actual figure

In the group of patients presented in 1 (A), 3, and 4 in table 11, the deviations between observed and expected number of deaths, as shown in columns (c) and (d), are not statistically significant and may be disregarded. However, the differences are considerable and significant between the expected and observed number of cancer deaths in the groups presented in 1 (B) and 2, that is, among white males who were not connected with the armed forces and among white females. In both of these groups the expectancy is 121.7±11.0 cancer deaths. Actually, only 71 occurred. In these two groups of white patients there were 27 additional cases of cancer in patients living on the last day of the observation period, December 31, 1939. Of these, 6 developed the malignancy before admission to the hospital. Some of the remaining 21 cancer cases (skin, lip, uterus, and breast) will die of the malignancy, but this figure would not supply the deficiency even if the time factor were disregarded.

Thirty-five percent of white male residents without military service were born in the North, and 65 percent were born south of 40° latitude. The corresponding figures for total cancer deaths in this group were 42 to 43 percent and 56.5 to 58.2 percent, respectively.[15]

An estimate of 74.1±8.6 cancer deaths was made for all white patients born north of 40° latitude, a large number of whom had been

[15] The southern-born white psychotic patients were, on the average, 4.2 years younger than those born farther north.

residing south of that parallel, while 54 deaths occurred. The difference of 20.1 is 2.3 times the standard error of the estimate. For white patients born south of 40° latitude, all of whom had lived all their lives or a considerable period of time in the South, 76.2±8.7 cancer deaths were estimated, while only 47 occurred. The difference of 29.2 deaths is highly significant.

CANCER AND TUBERCULOSIS—CANCER TREND

In institutions for the mentally ill, tuberculosis is thought to be a greater menace than cancer. According to the latest official report,[16] 8.8 percent of all deaths in mental institutions were due to tuberculosis and 3.7 percent were due to cancer. In St. Elizabeths Hospital the percentage of cancer deaths is much higher. As elsewhere, the majority of the deaths are due to diseases of the circulatory organs (arteriosclerosis, hypertension, cerebral hemorrhage, syphilis of the vessels, heart and coronary disease). During 1936 there were 26 deaths from tuberculosis in St. Elizabeths Hospital, or 9.7 percent of all deaths, and 17 deaths from cancer.[17] According to our own study, there were 20 deaths from cancer, or 7.4 percent of all deaths. These figures for tuberculosis and cancer are higher than the average for mental institutions in the United States.

In the years 1938 and 1939 and in the first 6 months of 1940, 650 persons died in St. Elizabeths Hospital. (See table 6.) Of these 650 deaths, 47, or 7.2 percent, were due to tuberculosis (28 white and 19 colored) and 62, or 9.5 percent, to cancer (34 white and 28 colored). The percentage of cancer deaths for this 2½-year period is much higher than the average percentage of cancer deaths for the whole 10-year period, 1930–39. In the first 4 years of this period, 1930–33, 6.4 percent of all deaths in St. Elizabeths Hospital were due to cancer; in 1934–36, 7.0 percent; in 1937–39, 8.0 percent; and in 1938–39 and the first half of 1940, 9.5 percent. This increase in the cancer ratio is analogous to the steady increase of cancer ratios and cancer rates shown in the official mortality statistics for the United States.

It is our purpose to record the fact that in St. Elizabeths Hospital, as in the general population, the tuberculosis problem is decreasing in importance while the cancer problem is increasing. The change in the tuberculosis-cancer ratio is certainly due to a more rapid improvement in hygienic conditions in institutions than is evident in such conditions among civilian populations. The gaps in these conditions are greater for colored than for white persons. Therefore, life in the hospital has a greater effect on the tuberculosis-cancer ratio for colored than for white patients.

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[16] Bureau of the Census, Vital Statistics—Special Reports, Deaths in Institutions, Vol. 7, No. 44, 1936.

[17] Op. cit., p. 327.

DISCUSSION

The low cancer mortality in the white residents of St. Elizabeths Hospital may be explained either by the assumption that the southern white population of the United States has low cancer mortality rates, or that the mentally ill have a lower cancer susceptibility than the average of the population. We find no supporting evidence for the latter assumption. Nevertheless, to reject this assumption it would be necessary to study cancer of the mentally ill in the northern part of the United States. In Norway [18] and in England [19] apparently no difference exists between the incidence of cancer in mental hospitals and in the general population. In our study 66 percent of the ex-soldiers were northern born. This group had cancer rates corresponding to the New York cancer experience. This sample, however, is too small to prove the point. Moreover, it is necessary to explain why this group does not have a lower cancer rate than the New York City population of corresponding ages. This would have been expected, in view of the results of studies previously carried on in the Army and the Navy. As mentioned before, there are included in this group of cancer patients beneficiaries of the Veterans' Administration as well as persons who many years ago served for a short time in the military service but were not entitled to the benefits of either the Veterans' Administration or the armed forces. Included in the study are persons who served in the Army for 2 or more years during the last half of the past century and who were admitted to St. Elizabeths Hospital 30, 40, or 50 years later. These cases of cancer were charged to the ex-soldiers, even if they were not so considered in the administration reports. Of the psychotic ex-soldiers who died of cancer, three-tenths served between 5 months and 3 years, and one-half between 5 months and 5 years. The records indicate that a comparatively small number of the psychotic ex-service men served or lived sufficiently long under climatic conditions which might have produced a superficial cancer. Thus, they were deprived of the protection which may be afforded by the preexistence of a superficial nonfatal cancer, and consequently developed internal cancer more frequently than the Army or Navy personnel.

The other assumption made above, i. e., that residents of St. Elizabeths Hospital have low cancer mortality rates because they have been a part of the southern white population of the United States, seems more probable. It would seem that the cancer rates are low in the white psychotic patients of St. Elizabeths Hospital because of the intensive exposure to sun which these patients had experienced

[18] Opsahl, R.: Norsk. Mag. Laegevidensk., 94: 771 (1933).

[19] Rudolf, G. M., and Ashby, W. R.: J. Ment. Sci., 80: 223 (1934); see also report in J. Ment. Sci., 76: 223 (1930).

for a long time prior to the development of mental disorder or prior to hospitalization. They have about the same age-specific cancer rates as the population of which they have been a part.

SUMMARY

1. An analysis is given of the 227 cancer cases which occurred in St. Elizabeths Hospital, Washington, D. C., among mental patients during a 10-year period; 189 of the cases were fatal; 155 were examined post mortem. Expected figures were calculated on the basis of the mortality statistics for New York City (1935).

2. The distribution of the fatal primary malignancies according to site does not reveal definite deviations from the expectancy. The percentage of skin and lip cancer among the patients is much smaller than expected. Further exploration of this deficit is indicated.

3. The ratio of cancer deaths for the 10-year period (7.1 percent) is low; the ratio for the years 1938–40 is higher than for the years 1930–37.

4. The cancer mortality of the white psychotic patients from the area in which the hospital is located is significantly lower than that of the corresponding white population of New York City. Two-thirds of the patients were born in the South; one-third were born in the North, but lived in the South before they were admitted to the hospital. For the group of patients born in the South, and residing there before admission, the mortality was 38.3 percent less than the expectancy, while for those who were born farther north and who migrated to the South it was 27.0 percent less than the expectancy.

5. The cancer mortality of the psychotic ex-soldiers and of the colored mental patients does not deviate from the data calculated on the cancer statistics of the white population of New York City. Of the white patients who were ex-service men, two-thirds were born north of 40° latitude. Only a small part of them was exposed to the climatic conditions of the South either in childhood or later.

6. The probability of metastasizing to the brain was studied for primary tumors of various organs. Cancer of lungs and adrenals has a higher probability of metastasizing to the cerebrum, exclusive of hypophysis, and cerebellum than cancer of all other organs. Cancer of the prostate has a much higher chance of metastasizing to the hypophysis, the leptomeninges, and the dura.

7. During the years 1938–40 the number of cancer deaths exceeded the number of tuberculosis deaths among the residents of St. Elizabeths Hospital; previous to 1938 tuberculosis deaths were more numerous.

ACKNOWLEDGMENTS

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AN INSTITUTIONAL OUTBREAK OF PNEUMONITIS [1]

III. HISTOPATHOLOGY IN MAN AND RHESUS MONKEYS IN THE PNEUMONITIS DUE TO THE VIRUS OF "Q" FEVER

By R. D. Lillie, *Senior Surgeon,* T. L. Perrin, *Passed Assistant Surgeon,* and Charles Armstrong, *Senior Surgeon, United States Public Health Service*

In the previous papers of this series, Hornibrook and Nelson (*1*) have described the epidemiological and clinical findings in an outbreak of pneumonitis at the National Institute of Health, and Dyer, Topping, and Bengtson (*2*) have reported the isolation of the causative agent and its identification with the virus of "Q" fever.

The purpose of this paper is to report the detailed pathologic findings in the fatal case, A. M., noted in Hornibrook and Nelson's report and to compare them with the findings in other human cases reported recently from other localities and with those in rhesus monkeys (*Macaca mulatta*) after intrapulmonary inoculation with the X, M, and P strains of "Q" fever virus. These virus strains were fully identified by Dyer, Topping, and Bengtson (*2*). One monkey inoculated with the sputum of case H. D. (*1*) gave pathologic findings identical with those seen in the other monkeys.

HUMAN CASE "A. M."

The patient was a white male, aged 59, gardener and incinerator operator. Onset as "cold" on April 17, 1940. Admitted to hospital on April 22, died on April 25. Had slight productive cough and chest pain on inspiration. Temperature on hospital admission 102° F., 103.5° F. maximum. Dullness over right lung from scapula to base posteriorly, smaller area on left. X-ray: "Pneumonitis" of right lower lobe, less on left. Blood: 6,200 white corpuscles, 82 percent neutrophils and 18 percent lymphocytes.

[1] From the Divisions of Pathology and of Infectious Diseases, National Institute of Health.

Gross post-mortem findings.[3]—Enlarged, dilated heart with widened mitral ring and no valve lesions. Moderate aortic atheroma. Congestion and edema of left lung, more marked in the lower lobe, congestion only of the right lower lobe; firm gray granular consolidation of right upper lobe posteriorly. Spleen is enlarged, soft and flabby; its pulp is soft and friable. Kidneys are of normal size, cortex 6 mm. thick, surface finely granular. Liver, gall bladder, adrenals, ureters, bladder, prostate, and pancreas show no significant alterations. There are large deposits of fat around pericardium and kidneys, and one inch of subcutaneous fat over the abdomen.

MICROSCOPIC FINDINGS

Lung.—There are two sections from the consolidated upper right lobe. Microscopically, these sections are diffusely consolidated, with alveoli, bronchioles, and most bronchi filled with an exudate which is chiefly fibrinocellular, and varies slightly in composition from field to field; in some areas it is difficult to make out alveolar outlines, and even bronchi and bronchioles are poorly defined. The exudate is usually quite compact, with fibrin as the chief component. The cells are of small to moderate number in each alveolus, are usually enmeshed in the fibrin, and consist chiefly of lymphocytes, plasma cells, and large mononuclear cells; red blood cells are numerous in scattered alveoli, but polymorphonuclears are few throughout. In addition to the cells noted above, elongated and pyknotic nuclei are common in the exudate, and proliferating fibroblasts are not uncommon; alveolar epithelium is prominent in some areas. In some small foci the fibrin is fragmented, and often phagocytic mononuclear cells slightly predominate in these areas. Bronchi and bronchioles, particularly the latter, are usually completely occluded by exudate similar to that present in alveoli; part or all of bronchial epithelium is usually desquamated, and the exudate appears to adhere to that portion of the wall which is denuded of epithelium. Interalveolar septa are slightly to moderately thickened with accumulation of lymphoid, plasma, and large mononuclear cells, and the capillaries contain little blood; definite fibrosis of variable degree is also noted. Lymphocyte and plasma cell infiltration of moderate degree is observed in peribronchial, perivascular, and pleural connective tissue, and there are focal accumulations of carbon-filled macrophages. A little fibrinocellular exudate on the pleura shows beginning organization. An occasional giant cell of the foreign body type is seen in the exudate; one of these is seen partially surrounding a fragmented corpus amylaceum.

[3] Acknowledgment is made to Doctor Aronstein and the staff of Providence Hospital for data on the gross post-mortem findings.

The remaining sections of lung show moderate congestion, accumulations of large mononuclear cells containing carbon and a very little hemosiderin in some alveoli, patchy areas of atelectasis with interalveolar fibrosis, chiefly subpleural, and patchy emphysema. In addition, one of the sections shows scattered, small, patchy peribronchial pneumonic areas. Bronchi in the latter areas contain purulent exudate, their epithelium has desquamated, and polymorphonuclears in moderate numbers infiltrate their walls which are focally necrotic. The pneumonic exudate consists of fibrin and variable proportions of polymorphonuclears, macrophages, and red blood cells. Gram-positive and gram-negative cocci are fairly numerous, and are chiefly intracellular. Peribronchial, perivascular, and pleural fibrosis is of moderate degree, and there is focal lymphocyte and plasma cell infiltration in these areas. Throughout all lung sections are small to moderate numbers of corpora amylacea. Pulmonary arteries, particularly in areas of atelectasis and fibrosis, show slight to moderate fibrosis of their walls.

Heart muscle.—Considerable irregular patchy fibrosis and fiber hypertrophy.

Abdominal aorta.—Moderate atherosclerosis, slight perivascular lymphocyte infiltration in media.

Liver.—Some centrolobular congestion, cell oxyphilia and necrosis, and intracapillary leucocytosis. Hyaline oxyphil globules and yellowish-brown pigment tinged green with polychrome methylene blue are seen in liver cells in centrolobular zones. Gall bladder and pancreas are negative.

Spleen.—Often deposition of oxyphil hyaline material with some nuclear debris in centers of splenic follicles. Pulp shows fairly marked diffuse congestion and sinus dilatation. Few neutrophil leucocytes and moderate numbers of large lymphoid and plasma cells are seen in the pulp.

Sternal marrow.—About half fatty and shows normal erythromyelopoietic activity.

Adrenal.—Slight congestion and scattered oxyphil karyopyknotic cortex cells. Lipoid content fairly high.

Prostate and *bladder.*—Normal.

Kidneys.—Patches of scarring and tubular atrophy and dilatation with glomerular obliteration and irregular lymphocyte infiltration, a small cortical adenoma, and, diffusely, swelling of glomeruli and convoluted tubule epithelium, few granular, oxyphil karyopyknotic tubules, and numbers of casts in collecting tubules.

PATHOLOGY IN MONKEYS

For comparison there are presented the pathologic findings in eight rhesus monkeys (*Macaca mulatta*) inoculated into the right lung with

four strains of "Q" fever virus. Data concerning inocula, strains, duration, and striking gross findings are given in table 1.

TABLE 1.—*Data on strains, inoculations, and gross lesions in monkeys*

Monkey	Strain	Source of inoculum	Passage generation	Day killed	Site of inoculation	Gross lesions at autopsy
566	M.	G. P. spleen	2d	5	Right lung	Purplish gray nodule 2×2.5 cm., right lower.
484	M.	Monkey 566	3d	5	do	Beefy red nodule right lower, red mottling left lower.
613	M.	Monkey 566	3d	5	do	Grayish nodule 2.5×2.5 cm., right lower.
652	M.	Monkey 544	3d	5	do	Consolidation upper part, right lower and focal in left lung.
480	P	G. P.	4th	6	do	Nodular consolidation left lung.
486	H.D.	Sputum	1st	13	do	Few small gray white foci, both lungs.
693	X	G. p. passage	ca. 125[1]	11	do	Small reddish nodules, right.
694	X	G. p. passage	ca. 125[1]	10	do	Small reddish patches, right.

[1] This strain was isolated in April 1938 and was passed through guinea pigs at approximately weekly intervals up to October 1940.

MICROSCOPIC FINDINGS

Lung.—The picture in all eight monkeys was similar, although the amount and extent of consolidation were variable. Consolidation is nodular or confluent nodular in type and generally peribronchial or peribronchiolar in location. The intranodular bronchi and bronchioles generally contain exudate which is variously seropurulent, mucopurulent, or serocellular in character, in the last instance containing neutrophil leucocytes, monocytes, desquamated epithelial cells, and, perhaps, erythrocytes. Alveolar contents are quite varied from nodule to nodule and often within the same field.

The least extensive and probably the earliest phase of the pneumonic process shows alveoli containing serum and neutrophil leucocytes. Partly hyalinized masses of fibrin were found in one monkey. Alveoli are found containing variable proportions of loosely packed neutrophil leucocytes and large, round, lightly basophil monocytes with leptochromatic nuclei and minute nucleoli. Septa in these areas are perhaps somewhat thickened and infiltrated by rather similar monocytes and fewer lymphocytes. Around larger vessels lymphocyte infiltration is more marked and monocytes are fewer. Septa are lined by coherent swollen vacuolated epithelial cells with vesicular nuclei and conspicuous nucleoli, and a few similar, but more vacuolated, cells participate in the alveolar exudate. In most of the consolidated areas interstitial infiltration is more pronounced and comprises more lymphocytes than monocytes; swollen vacuolated alveolar epithelium is more often seen; and alveoli are partly collapsed and filled by proliferating thick fusiform, stellate and polygonal epithelioid cells, less often slender fibroblasts, mingled still with rounded monocytes in greater or less numbers, and some neutrophil leucocytes, swollen foamy epithelial cells with their characteristic vesicular nuclei and

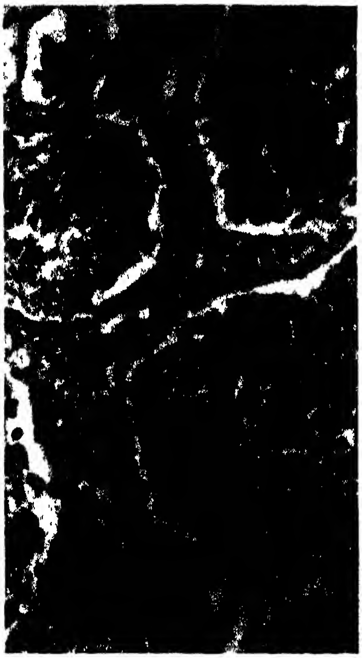

FIGURE 1.—A. M. Septal thickening and lymphocyte infiltration, fibrin, lymphocytes, and large mononuclear cells in exudate. X400.

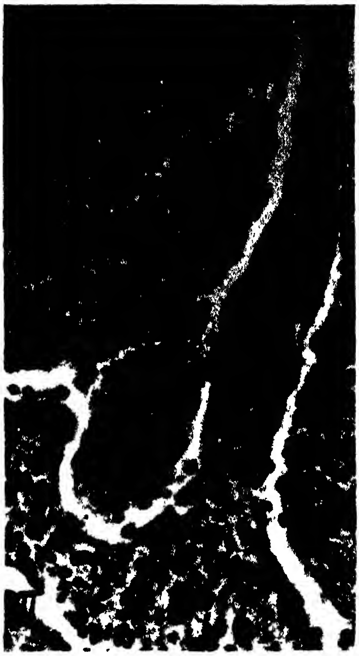

FIGURE 2.—A. M. Septal thickening, lymphocyte infiltration, and epithelial swelling, fibrinocellular exudate. X400

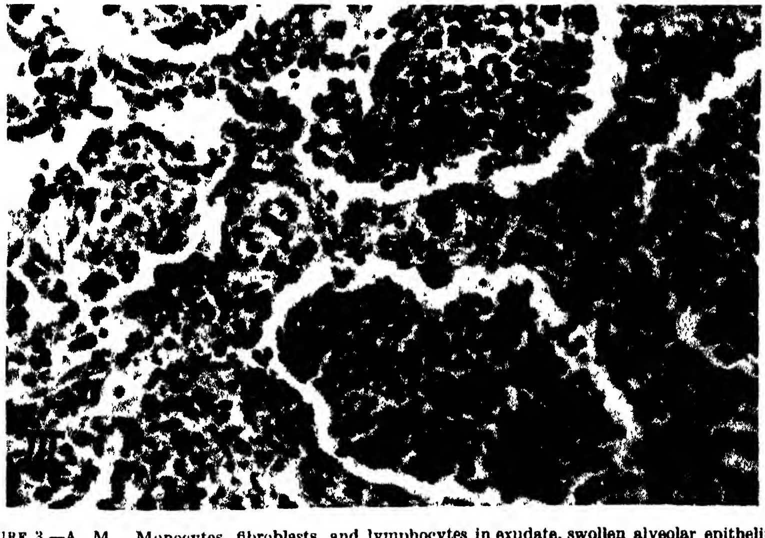

FIGURE 3.—A. M. Monocytes, fibroblasts, and lymphocytes in exudate, swollen alveolar epithelium, thick septa. X400.

FIGURE 4.—Monkey 486, 13 days Thick fusiform epithelioid cells and few leucocytes in exudate, septal lymphocyte infiltration. ×400.

FIGURE 5.—Monkey 566, 5 days. Fibrinocellular alveolar exudate. ×400.

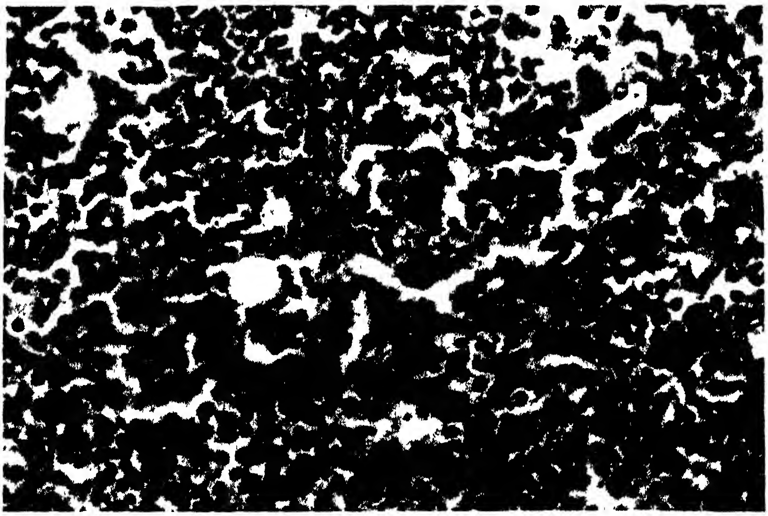

FIGURE 6.—Monkey 566, 5 days. Septal lymphocyte infiltration, monocytic epithelioid cell exudate ×400.

large nucleoli and, perhaps, lymphocytes. Larger vessels are densely mantled by lymphocytes or lymphocytes and monocytes. Periarterial lymphatics are often distended by serum, monocytes, and lymphocytes. Occasionally there is lymphocyte infiltration of the intima of small arteries.

The pleura over consolidated areas, focally elsewhere and about the hilus, shows patches of stratifying mesothelial proliferation with infiltration by neutrophil or, in three instances, eosinophil leucocytes, subjacent lymphocyte, or lymphocyte and monocyte infiltration; in two instances, subpleural and surface exudation of thready, metachromatically basophil material resembling mucus, and in two others patches of organizing fibrin.

It should be recorded that in rhesus monkeys pulmonary pictures are often complicated by pulmonary acariasis. Portions of parasites identified tentatively as *Pneumonyssus foxi* were seen in dilated bronchioles in five of the eight monkeys. Similarly dilated bronchioles with fibrosed atrophic mucosae densely infiltrated by lymphocytes but containing no parasite fragments were more numerous in the same five monkeys. Masses of light brown granular pigment, which stains blue-black with Romanowsky stains, mingled with small angular black particles, and fine acicular doubly refractile crystals were seen in the mucosae of such bronchi; doubly refractile material was present in the bodies of the parasites; and, in all of the monkeys, greater or less quantities of the same pigment were present in the sheaths of pulmonary arteries. This picture has appeared repeatedly in many monkeys from various other studies.

Sections of *heart* were made in six monkeys killed 5, 10, and 11 days after inoculation. All showed relatively few scattered foci of lymphocyte infiltration, usually perivascular, in the epicardial fat or myocardium, or both. Small foci of fibroblast proliferation in the ventricular muscle were noted in one. In one monkey vascular endothelial proliferation and perivascular infiltration by lymphocytes and plasma cells were noted (10 days).

The *larynx* showed, respectively, moderate and fairly dense mucosal and periglandular lymphocyte infiltration in the two monkeys in which it was studied. The trachea showed similar findings.

The *thyroid* of four monkeys and the *parathyroid* of one of them showed no lesions.

Focal periductal lymphocyte infiltration was seen in the *submaxillary gland* in two monkeys and in two others there were no lesions.

Occasional foci of lymphocyte infiltration were noted in the *esophagus* in the mucosa in one and in the muscularis in one; in a third monkey none were noted.

Gastric mucosa generally showed more or less lymphocyte infiltration, sometimes with plasma cells as well. This infiltration was more

marked in the fundus in two monkeys, about equal in one, and more in the antrum in three. Definite follicles with germinal centers were present in three. While lymphocyte infiltration is not uncommon in the gastric mucosa of monkeys, the impression is that it is increased in this series.

The *small intestine* was normal, or its mucosa showed a slight increase in lymphocyte content. No significant lesions of the *colon* were noted in five monkeys.

The *liver* was normal in two monkeys and there was a slight to moderate focal interstitial or periportal lymphocyte infiltration, or both, in the remaining five. Gall bladder was normal in two monkeys.

The *pancreas* showed no lesions in four monkeys.

The *adrenal* showed slight focal lymphocyte infiltration of the cortex in one and a lymphoid nodule at the medullary border in another. No lesions were seen in three monkeys.

Varying grades of swelling, granular degeneration, and dilatation of *renal* convoluted tubules, which contained granular or foamy oxyphil exudate, were observed in three monkeys. The kidney was normal in a fourth. Two monkeys showed normal tubules and a little lymphocyte infiltration in the sheath of an arcuate artery in one, sparse lymphocyte infiltration in the pelvic mucosa in the other.

The juvenile *testis* and *epididymis* were normal in two monkeys. The *tubal fimbria* was normal in one, the *ovary* showed an occasional focus of perivascular lymphocyte infiltration in another. In both of these female monkeys there was much endometrial hemorrhage. They showed also focal interstitial and perivascular lymphocyte infiltration in the myometrium and in the cervix.

The *urinary bladder* showed irregular diffuse and perivascular lymphocyte infiltration of the mucosa in each of two female monkeys.

Omentum was normal in one monkey and in another showed an occasional patch of surface mesothelial proliferation and swelling with subjacent fibroblast proliferation and infiltration by monocytes, eosinophils, and lymphocytes.

Skeletal muscle was normal except for slight sarcosporidiosis in one monkey.

Splenic follicles are moderate in size to rather large and usually exhibit pale germinal centers. Phagocytic follicular reticulum cells are infrequent. The blood content of the pulp is not greatly increased. There is usually a moderate pulp infiltration by lymphocytes, accompanied in one monkey by considerable numbers of neutrophil leucocytes in the blood spaces, and in three other monkeys by lesser numbers of large lymphoid and plasma cells. Slight to moderate swelling of sinus reticulo-endothelium was evident in three of the seven monkeys. free monocytes or macrophages in two. In one monkey a few

vague nodules of epithelioid cells and fragmenting leucocytes were seen in the spleen pulp and in the bone marrow.

Femoral marrow was studied in four monkeys. Nodules of irregularly disposed epithelioid cells and intact or fragmenting neutrophil leucocytes were seen in two, and another showed solid lymphocytic nodules. Otherwise, the marrow was about half fatty (midfemoral region) and contained considerable numbers of promyelocytes as well as neutrophil and eosinophil myelocytes, metamyelocytes, and leucocytes. In one there were considerable numbers of large pale cells with leptochromatic nuclei, possibly monoblasts; in another, increased numbers of megakaryocytes. Erythropoiesis was slightly or moderately active.

Some *lymph nodes* showed follicle swelling and hyperplasia and phagocytosis of nuclear debris by follicle phagocytes, sinus dilatation, and swelling of sinus endothelium and pulp reticulum cells. Other (abdominal) nodes showed essentially no lesions.

DISCUSSION

The pneumonic process appears to be essentially identical in the human case and in the eight monkeys, and corresponds closely, allowing for differences in nomenclature and concepts of the basic histology of the lung, with the picture described by Kneeland and Smetana (*3*). The presence of "round cell" exudate and of "organization of old exudate" in a case fatal on the sixteenth day (Longcope's Case 9) (*4*) is suggestive. The arterial necroses noted in Kneeland and Smetana's case and in one of Longcope's were absent in our human case and in the monkeys. Small foci of purulent pneumonia with gram-positive cocci were present in Kneeland and Smetana's case, in Longcope's Case 9, and in our human case, but absent in Longcope's Case 8 and in the monkeys.

Rickettsiae were not seen in any of our human or simian material.

The spleen also has shown a similar picture in our human case and in the monkeys. This picture may be the same as Kneeland and Smetana's "acute splenic tumor." Longcope does not discuss the spleen.

REFERENCES

(*1*) Hornibrook, J. W., and Nelson, K. R.: An institutional outbreak of pneumonitis. I. Epidemiological and clinical studies. Pub. Health Rep., **55**: 1936–1944 (1940).

(*2*) Dyer, R. E., Topping, N. H., and Bengtson, I. A.: An institutional outbreak of pneumonitis. II. Isolation and identification of causative agent. Pub. Health Rep., **55**: 1945–1954 (1940).

(*3*) Kneeland, Y., and Smetana, H. F.: Current bronchopneumonia of unusual character and undetermined etiology. Bull. Johns Hopkins Hosp., **67**: 229 (1940).

(*4*) Longcope, W. T.: Bronchopneumonia of unknown etiology (Variety X). A report of thirty-two cases with two deaths. Bull. Johns Hopkins Hosp., **67**: 268 (1940).

COURT DECISION ON PUBLIC HEALTH

Statutory provisions for protection of employees against gases, vapors, dust, etc., upheld.—(Tennessee Supreme Court; *Holliston Mills of Tennessee* v. *McGuffin*, 145 S.W.2d 1; decided November 23, 1940.) Section 5339 of the Tennessee Code required that every factory, etc., employing five or more persons should be so ventilated as to prevent the air from becoming injurious to the health of employees and as to render harmless, as far as practicable, all gases, vapors, dust, or other impurities generated in the course of the manufacturing process or handicraft carried on. Section 5340, relating to factories, etc., carrying on work producing dust, filaments, or injurious gases, required the providing of "exhaust fans, conveyors, receptacles, or blowers with pipes and hoods extending therefrom to each machine, contrivance or apparatus by which dust, filaments, or injurious gases are produced or generated" or the providing of "other mechanical means" for "carrying off or receiving and collecting such dust, filament, devitalized air, or other impurities as may be detrimental to the health of those in or about, or in connection with," the place. It was further required that the "fans, blowers, pipes and hoods shall be properly fitted and adjusted and of power and dimensions sufficient to effectually prevent the dust, filaments, or injurious gases produced or generated by said machines, contrivances, or apparatus from escaping into the atmosphere" of the rooms of the establishment where persons were employed.

The constitutionality of these statutory provisions was questioned in an action brought by an employee against the employer to recover for injuries alleged to have resulted from the employer's failure to install and maintain such ventilation machinery as would protect against the injurious effects of poisonous fumes and gases generated in the course of the operation of the plant. On appeal by the employer to the supreme court from an adverse judgment, one of the contentions advanced by the employer was that the said statute was unconstitutional because (1) it was so vague and indefinite in its terms that it did not give notice of just what would constitute a violation thereof, and (2) it delegated authority which belonged alone to the legislature, the officials named being empowered to determine what was and what was not required by, or a violation of, the law. The court found no merit in either of these grounds of alleged unconstitutionality.

Other contentions of the employer were also rejected and the judgment of the lower court in favor of the plaintiff was affirmed.

DEATHS DURING WEEK ENDED JANUARY 11, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 11, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,803	9,716
Average for 3 prior years	9,319	
Total deaths, first 2 weeks of year	19,055	18,966
Deaths under 1 year of age	567	561
Average for 3 prior years	554	
Deaths under 1 year of age, first 2 weeks of year	1,152	1,128
Data from industrial insurance companies:		
Policies in force	64,728,125	66,406,002
Number of death claims	12,069	12,708
Death claims per 1,000 policies in force, annual rate	10.2	10.0
Death claims per 1,000 policies, first 2 weeks of year, annual rate	9.2	9.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 18, 1941

Summary

Another rise in the incidence of influenza was recorded for the current week, with a total of 119,006 cases reported as compared with 89,828 for the preceding week—an increase of 32 percent as compared with 16 percent for the preceding week and a 70 percent increase for the week ended January 4. This is the largest number of cases of influenza reported to the Public Health Service for any week since January 12, 1929.

The disease has spread eastward through, and the current incidence is preponderantly highest in, the southern States. For the current week, 100,929 cases, or 85 percent of the total, were reported from the 3 southern geographic areas—South Atlantic, East South Central, and West South Central. The South Atlantic States recorded the largest number of cases and the largest numerical increase (from 13,629 to 46,255 cases). In this area the incidence increased in Virginia from 4,200 to 13,592, in West Virginia from 430 to 8,867, in South Carolina from 3,686 to 11,004, and in Georgia from 5,002 to 10,702.

Texas, with 30,713 cases, accounted for most of the 39,392 cases reported in the West South Central area, which, together with the other western areas, registered a decline. Slight increases were recorded for the New England, Middle Atlantic, and East North Central States, but the incidence in these sections has been, and is currently, low as compared with the western and southern areas.

Of the other 8 communicable diseases included in the weekly reports in the following table, only measles, poliomyelitis, and whooping cough were above the 5-year (1936–40) median. Of 51 cases of smallpox, 43 cases were reported in the two North Central groups of States.

Two cases of tularemia each were reported in Maryland and South Carolina, and of 21 cases of endemic typhus fever, 6 were in Texas and 5 in Georgia.

For the current week the Bureau of the Census reports 9,720 deaths in 88 major cities of the United States, as compared with 9,801 for the preceding week and with a 3-year (1938–40) average of 9,111.

Telegraphic morbidity reports from State health officers for the week ended January 18, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940	
NEW ENG.												
Maine	0	0	2	1,421	30	5	18	105	102	0	0	0
New Hampshire	0	0	0	1,000	------	------	6	20	22	0	0	0
Vermont	0	0	0	81	------	------	41	13	13	0	0	0
Massachusetts	3	15	6	------	------	------	364	210	370	0	0	1
Rhode Island	0	0	0	16	------	------	0	125	125	0	0	0
Connecticut	0	6	5	1,718	4	13	13	121	121	0	0	0
MID ATL.												
New York [2]	18	28	39	[1] 215	[1] 19	[1] 22	1,504	175	400	4	1	6
New Jersey	18	9	15	95	25	15	645	23	42	3	0	2
Pennsylvania	24	30	36	------	------	------	1,862	61	131	3	2	6
E. NO. CEN.												
Ohio [2]	8	21	33	2,799	9	9	565	23	39	1	2	2
Indiana	11	19	22	703	58	44	55	4	8	0	1	2
Illinois	22	25	39	83	34	57	870	47	45	1	2	2
Michigan	5	12	12	238	6	6	1,088	465	465	0	0	2
Wisconsin	0	0	1	152	54	52	421	282	282	1	1	0
W. NO. CEN												
Minnesota	0	0	2	6	2	3	6	206	122	2	0	0
Iowa	8	0	5	285	3	9	183	36	36	0	0	0
Missouri	7	15	15	218	70	176	15	11	13	1	1	1
North Dakota	5	0	2	268	131	17	19	4	5	1	0	0
South Dakota	2	0	0	1	1	------	11	0	2	0	0	0
Nebraska	3	1	2	64	------	------	8	20	20	0	0	0
Kansas	4	7	9	2,040	125	12	169	174	15	0	1	0
SO. ATL.												
Delaware	0	0	1	54	------	------	20	2	8	0	0	0
Maryland [2]	3	13	10	300	59	27	11	3	143	0	0	2
District of Columbia	2	0	8	172	9	6	4	7	7	0	0	1
Virginia	12	9	25	13,592	1,128	------	194	14	69	1	0	2
West Virginia [2]	9	9	14	8,867	40	56	217	2	17	0	3	4
North Carolina [2]	28	27	29	750	403	35	169	86	86	0	2	2
South Carolina [2]	7	2	4	11,004	2,825	861	70	2	8	1	1	2
Georgia [2]	10	13	12	10,702	1,626	284	64	18	18	0	1	3
Florida	4	8	9	814	59	5	8	7	7	0	0	2
E. SO. CEN.												
Kentucky	5	9	10	2,666	29	37	65	27	55	0	1	7
Tennessee	9	12	14	3,994	185	185	49	47	47	1	3	3
Alabama [2]	10	10	14	8,622	1,085	313	87	42	42	1	1	1
Mississippi [2]	5	13	11	------	------	------	------	------	------	2	1	1
W. SO. CEN.												
Arkansas	11	10	15	3,999	1,799	218	61	0	5	1	0	1
Louisiana [2]	7	6	16	2,164	21	26	2	5	5	1	1	2
Oklahoma	13	7	15	2,516	422	191	0	1	3	0	0	2
Texas [2]	50	42	53	30,713	1,405	739	178	261	195	5	1	1
MOUNTAIN												
Montana	1	1	0	901	------	8	5	12	7	0	0	0
Idaho	0	0	0	3	------	1	0	4	59	0	0	0
Wyoming	4	1	0	942	3	------	4	9	2	0	0	0
Colorado	9	9	8	1,095	73	------	32	39	39	0	0	0
New Mexico	0	4	1	69	27	21	25	16	32	0	0	1
Arizona	8	5	7	711	230	145	64	9	6	0	0	0
Utah [2]	1	0	0	793	75	2	19	164	29	0	0	0
Nevada	1	------	------	109	------	------	0	------	------	0	------	------
PACIFIC												
Washington	2	0	1	448	9	1	60	521	112	2	0	1
Oregon	4	6	2	276	190	56	102	130	22	0	0	0
California [2]	20	11	36	2,327	295	131	105	246	246	4	3	1
Total	378	415	597	120,006	12,568	8,144	9,487	3,799	4,884	36	29	72
3 weeks	949	1,446	1,927	286,978	34,714	9,370	28,971	11,250	13,296	104	87	273

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 18, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940	
NEW ENG.												
Maine	0	0	0	6	3	16	0	0	0	0	0	0
New Hampshire	0	0	0	9	5	7	0	0	0	0	0	0
Vermont	0	0	0	12	3	6	0	0	0	0	0	0
Massachusetts	0	1	0	117	136	235	0	0	0	0	4	1
Rhode Island	0	0	0	5	8	25	0	0	0	0	0	0
Connecticut	0	0	0	50	78	75	0	0	0	1	1	1
MID. ATL.												
New York [2]	2	1	1	386	461	584	0	0	0	7	9	6
New Jersey	0	0	0	238	278	146	0	0	0	0	1	1
Pennsylvania	1	4	1	276	422	500	0	0	0	4	6	6
E. NO. CEN.												
Ohio [3]	1	1	2	223	251	300	0	0	3	2	2	2
Indiana	0	1	0	127	142	228	1	3	4	3	0	1
Illinois	2	0	0	380	419	558	0	1	21	2	6	6
Michigan	1	0	0	195	325	574	5	0	0	3	2	2
Wisconsin	4	0	0	135	137	303	10	12	13	1	0	0
W. NO. CEN.												
Minnesota	0	2	0	56	156	156	10	11	28	0	0	0
Iowa	0	1	0	54	87	165	9	3	15	3	1	1
Missouri	1	0	0	77	75	206	5	0	18	7	3	3
North Dakota	0	0	0	5	10	21	0	0	5	1	2	0
South Dakota	0	0	0	23	14	26	0	2	10	0	0	0
Nebraska	0	0	0	31	27	39	2	0	1	0	0	0
Kansas	3	0	0	94	89	198	1	0	26	0	0	1
SOUTH ATLANTIC												
Delaware	0	0	0	18	21	14	0	0	0	0	0	0
Maryland [3]	0	0	0	63	40	62	0	0	0	4	1	3
Dist. of Col.	1	1	0	18	21	18	0	0	0	0	0	1
Virginia	0	0	0	39	29	29	0	1	0	2	3	6
West Virginia [3]	3	0	0	48	60	60	0	0	0	1	3	2
North Carolina [2]	1	1	0	66	61	45	0	0	0	0	1	2
South Carolina [2]	0	1	1	15	14	7	0	0	0	3	3	2
Georgia [2]	0	0	1	26	40	21	1	0	0	2	1	2
Florida	1	0	0	3	2	9	0	1	0	0	0	0
E. SO. CEN.												
Kentucky	0	1	0	54	76	81	0	0	0	0	0	2
Tennessee	2	0	1	92	97	38	0	0	0	2	2	2
Alabama [2]	0	0	1	26	20	18	0	0	0	0	3	3
Mississippi [3]	0	1	1	13	4	9	0	0	0	0	1	1
W. SO. CEN.												
Arkansas	0	0	0	9	17	11	0	16	5	4	3	3
Louisiana [2]	2	1	0	5	12	21	0	0	0	11	7	6
Oklahoma	0	0	0	26	25	51	5	1	1	2	2	2
Texas [2]	0	4	0	58	93	107	0	1	2	8	15	11
MOUNTAIN												
Montana	0	0	0	26	53	53	0	0	12	0	0	0
Idaho	2	3	0	13	11	38	0	0	8	0	0	0
Wyoming	1	0	0	6	10	10	0	0	1	0	0	0
Colorado	1	2	0	23	46	61	0	15	11	0	2	0
New Mexico	0	0	0	6	14	25	0	0	0	1	0	2
Arizona	0	0	0	2	17	17	0	0	0	1	0	0
Utah [3]	0	0	0	5	23	31	0	0	0	2	0	0
Nevada	0	-----	-----	0	-----	-----	0	-----	-----	0	-----	-----
PACIFIC												
Washington	2	0	0	38	78	67	0	0	4	2	0	0
Oregon	0	0	1	11	35	47	2	1	5	0	2	0
California [3]	1	7	1	107	154	262	0	12	12	2	5	5
Total	32	33	23	3,315	4,229	5,844	51	80	278	81	91	113
3 weeks	133	118	66	9,189	11,960	17,281	144	264	869	240	250	333

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 18, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Whooping cough—Week ended— Jan. 18, 1941	Whooping cough—Week ended— Jan. 20, 1940
NEW ENG.		
Maine	10	60
New Hampshire	1	3
Vermont	18	40
Massachusetts	216	187
Rhode Island	13	12
Connecticut	75	72
MID. ATL.		
New York [1]	451	434
New Jersey	140	123
Pennsylvania	562	373
E. NO. CEN.		
Ohio [2]	383	128
Indiana	18	36
Illinois	133	84
Michigan	349	146
Wisconsin	115	150
W. NO. CEN.		
Minnesota	72	63
Iowa	43	2
Missouri	38	15
North Dakota	15	17
South Dakota	5	0
Nebraska	61	1
Kansas	65	11
SO. ATL.		
Delaware	7	3
Maryland [3]	80	86
District of Columbia	14	8
Virginia	89	43
West Virginia [3]	86	18
North Carolina [2]	370	45
South Carolina [2]	97	9
SO. ATL.—continued		
Georgia [2]	24	20
Florida	11	14
E. SO. CEN.		
Kentucky	23	77
Tennessee	49	42
Alabama [2]	52	19
Mississippi [3]	---------	---------
W. SO. CEN.		
Arkansas	24	3
Louisiana [2]	4	14
Oklahoma	24	3
Texas [2]	199	111
MOUNTAIN		
Montana	6	5
Idaho	10	0
Wyoming	0	24
Colorado	33	8
New Mexico	12	32
Arizona	29	15
Utah [3]	50	87
Nevada	0	---------
PACIFIC		
Washington	103	30
Oregon	10	32
California [2]	436	163
Total	4,625	2,868
3 weeks	12,727	7,739

[1] New York City only.
[2] Typhus fever, week ended Jan. 18, 1941, 21 cases, as follows: New York, 1; Ohio, 1; North Carolina, 2; South Carolina, 2; Georgia, 5; Alabama, 2; Louisiana, 1; Texas, 6; California, 1.
[3] Period ended earlier than Saturday.

PSITTACOSIS IN CONNECTICUT

Under date of January 8, 1941, a delayed report of a case of psittacosis was received from Dr. Stanley H. Osborn, Commissioner of Health of Connecticut. The patient was living in an apartment with a patient previously reported as having psittacosis (Public Health Reports, Dec. 20, 1940). The illness was so mild in the second case that a diagnosis of psittacosis was not made until Dr. Karl Meyer of San Francisco reported isolating psittacosis virus from the patient's sputum.

WEEKLY REPORTS FROM CITIES

City reports for week ended January 4, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	163	808	108	1,574	879	1,449	26	351	20	1,015	--------
Current week [1]	72	12,794	131	3,660	626	808	4	307	22	1,128	--------
Maine:											
Portland	0	------	0	1	6	0	0	0	0	26	30
New Hampshire:											
Concord	0	------	0	0	0	3	0	0	0	0	8
Manchester	0	------	0	0	1	8	0	0	0	0	13
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	--------
Burlington	0	------	0	0	0	0	0	0	0	0	11
Rutland	0	------	0	0	0	0	0	0	0	0	7
Massachusetts:											
Boston	0	------	1	129	5	37	0	10	0	87	263
Fall River	1	------	0	9	0	9	0	0	0	0	25
Springfield	0	------	0	1	1	3	0	0	0	1	26
Worcester	0	------	0	80	6	5	0	0	1	0	67
Rhode Island:											
Providence	0	------	2	0	7	1	0	0	0	11	78
Connecticut:											
Bridgeport	0	------	0	0	1	4	0	0	0	2	32
Hartford	0	2	0	2	2	3	0	0	0	4	61
New Haven	0	1	1	2	3	9	0	0	0	16	53
New York:											
Buffalo	0	------	1	57	10	12	0	7	0	39	134
New York	15	77	1	1,021	66	132	0	60	2	137	1,540
Rochester	0	3	0	5	7	2	0	1	0	9	80
Syracuse	0	------	0	0	1	1	0	1	1	12	46
New Jersey:											
Camden	2	1	1	76	4	6	0	2	0	0	30
Newark	0	1	0	99	0	16	0	2	0	20	71
Trenton	0	------	0	2	9	28	0	1	0	4	63
Pennsylvania:											
Philadelphia	3	12	6	405	32	55	0	22	1	96	530
Pittsburgh	3	18	3	5	16	8	0	4	0	41	188
Reading	0	------	0	91	2	2	0	1	0	9	24
Scranton	0	------	--------	0	--------	0	0	------	0	4	--------
Ohio:											
Cincinnati	2	------	1	6	13	14	0	3	0	7	135
Cleveland	0	26	1	89	14	20	0	8	0	55	181
Columbus	0	2	2	6	10	3	0	2	0	11	91
Toledo	0	2	2	0	4	11	0	2	0	9	76
Indiana:											
Anderson	1	------	0	0	0	3	0	0	0	0	5
Fort Wayne	0	------	0	2	3	1	0	1	0	0	28
Indianapolis	7	------	1	6	9	19	0	7	0	7	96
Muncie	0	------	0	0	5	0	0	0	0	0	15
South Bend	0	------	0	0	4	0	0	0	0	0	17
Terre Haute	0	------	1	0	2	1	0	0	0	0	27
Illinois:											
Alton	0	------	0	0	3	2	0	0	0	0	--------
Chicago	11	10	3	723	38	126	0	27	1	95	691
Elgin	0	------	0	0	1	0	0	0	0	0	18
Springfield	0	------	0	1	4	5	0	0	0	0	20
Michigan:											
Detroit	5	4	0	643	26	71	1	10	0	126	301
Flint	0	------	1	24	1	8	0	0	0	4	30
Grand Rapids	0	------	0	4	4	5	0	0	0	13	39
Wisconsin:											
Kenosha	0	------	0	2	1	1	0	0	0	1	10
Madison	0	------	0	0	3	3	0	0	0	0	23
Milwaukee	0	------	0	20	0	15	0	0	0	47	88
Racine	0	------	0	2	0	6	0	0	0	1	15
Superior	0	------	0	1	0	2	0	0	0	0	9
Minnesota:											
Duluth	0	------	1	1	0	3	2	0	0	5	22
Minneapolis	0	------	0	0	1	7	0	0	0	3	113
St. Paul	0	------	0	1	11	8	0	0	1	12	64

[1] Figures for Barre estimated; report not received.

City reports for week ended January 4, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	------	------	0	------	3	0	------	0	0	------
Davenport	1	1	------	0	------	2	0	------	0	0	------
Des Moines	18	------	0	1	0	2	0	0	0	0	31
Sioux City	0	------	------	0	------	4	0	------	0	4	------
Waterloo	0	------	------	0	------	1	0	------	0	2	------
Missouri:											
Kansas City	1	1	3	4	13	10	0	3	0	8	135
St. Joseph	0	------	0	0	4	0	0	1	0	0	31
St. Louis	3	36	0	3	28	35	0	10	2	18	294
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	8	6
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	0	0	0	0	0	0	0	7
South Dakota:											
Aberdeen	0	------	------	1	------	8	0	------	0	0	------
Sioux Falls	0	------	0	0	0	2	0	0	0	0	12
Nebraska:											
Lincoln	0	------	------	2	------	5	0	------	0	1	------
Omaha	0	------	1	0	3	3	1	1	0	0	51
Kansas:											
Lawrence	0	------	0	2	1	0	0	0	0	0	1
Topeka	0	3	0	3	4	0	0	1	0	1	36
Wichita	0	64	0	0	10	0	0	2	0	23	39
Delaware:											
Wilmington	0	------	0	7	4	2	0	0	0	2	41
Maryland:											
Baltimore	0	10	3	4	23	13	0	8	0	40	213
Cumberland	0	------	0	0	1	1	0	0	0	0	16
Frederick	0	------	0	0	0	0	0	0	0	0	5
Dist. of Col.:											
Washington	1	68	1	2	16	10	0	10	0	13	162
Virginia:											
Lynchburg	1	------	0	0	1	3	0	1	0	0	9
Norfolk	1	78	0	0	3	0	0	0	0	0	22
Richmond	0	------	3	2	0	2	0	1	1	0	57
Roanoke	1	------	0	26	0	0	0	0	0	1	29
West Virginia:											
Charleston	0	------	0	0	3	0	0	0	0	0	30
Wheeling	0	------	0	1	2	0	0	0	0	2	35
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	1	------
Raleigh	0	------	0	0	2	1	0	1	0	4	13
Wilmington	1	------	0	1	2	0	0	0	1	5	10
Winston-Salem	1	------	0	0	2	0	0	3	0	23	22
South Carolina:											
Charleston	0	145	0	11	4	0	0	0	0	2	23
Florence	0	14	0	5	1	0	0	0	0	2	10
Greenville	0	------	0	1	0	1	0	0	0	14	4
Georgia:											
Atlanta	0	263	0	0	10	3	0	3	0	0	86
Brunswick	0	------	0	0	0	0	0	0	0	1	3
Savannah	0	43	0	0	0	1	0	0	0	0	35
Florida:											
Miami	1	5	1	0	1	0	0	0	0	0	48
Tampa	0	2	2	0	1	0	0	1	0	0	27
Kentucky:											
Ashland	0	------	0	0	4	1	0	1	0	0	17
Covington	0	1	0	7	2	1	0	1	0	1	11
Lexington	0	------	0	73	2	0	0	0	0	1	16
Louisville	0	117	0	2	8	8	0	1	0	7	83
Tennessee:											
Knoxville	0	31	0	0	4	1	0	2	0	1	24
Memphis	0	192	9	15	7	4	0	9	0	5	94
Nashville	0	------	1	0	6	5	0	1	0	3	48
Alabama:											
Birmingham	1	------	1	6	6	3	0	0	0	5	67
Mobile	1	161	8	0	8	0	0	2	0	0	43
Montgomery	0	8	------	1	------	2	0	------	0	0	------
Arkansas:											
Fort Smith	0	71	------	0	------	0	0	------	0	0	------
Little Rock	0	417	0	1	2	4	0	0	0	0	15
Louisiana:											
Lake Charles	0	------	1	0	1	0	0	0	0	0	11
New Orleans	2	24	8	2	11	2	0	18	6	2	193
Shreveport	0	496	1	0	5	0	0	1	2	0	55

City reports for week ended January 4, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	263	1	0	11	3	0	0	0	0	55
Tulsa	2	------	0	3	14	2	1	1	0	2	60
Texas:											
Dallas	0	13	5	0	13	0	0	4	1	0	97
Fort Worth	0	------	4	7	4	1	0	1	0	3	48
Galveston	1	------	0	0	3	0	0	0	0	0	21
Houston	2	9,049	2	1	18	6	0	11	0	0	160
San Antonio	2	106	20	0	21	0	0	6	0	2	79
Montana:											
Billings	0	1	0	0	2	0	0	0	0	0	13
Great Falls	0	6	0	0	0	1	0	0	0	0	13
Helena	0	135	0	0	0	2	0	0	0	0	4
Missoula	0	193	0	0	1	2	0	0	0	0	13
Idaho:											
Boise	0	------	0	0	2	2	0	0	0	0	7
Colorado:											
Colorado Springs	0	------	0	1	1	3	0	2	0	3	12
Denver	0	402	11	20	16	5	0	4	0	7	140
Pueblo	1	------	0	31	3	1	0	1	1	0	15
New Mexico:											
Albuquerque	0	17	0	0	5	0	0	1	0	0	12
Utah:											
Salt Lake City	0	------	1	3	5	2	0	1	0	2	57
Washington:											
Seattle	0	------	0	1	2	1	0	2	0	3	80
Spokane	0	87	6	1	4	7	0	0	0	1	51
Tacoma	0	------	2	1	3	1	0	0	0	2	36
Oregon:											
Portland	0	104	7	0	5	4	0	2	0	0	107
Salem	0	33	------	0	------	0	0	------	0	1	------
California:											
Los Angeles	4	590	15	3	24	19	0	20	1	26	371
Sacramento	0	36	3	1	9	4	0	4	0	2	44
San Francisco	0	94	3	4	8	2	0	8	0	16	181

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Maine:			
Portland	1	0	0
Massachusetts:			
Boston	1	1	0
New York:			
New York	2	0	0
Pennsylvania:			
Pittsburgh	1	1	0
Indiana:			
Fort Wayne	0	0	1
Michigan:			
Detroit	1	0	0
Maryland:			
Baltimore	0	0	1
North Carolina:			
Winston-Salem	1	1	0
Florida:			
Miami	0	0	2
Tennessee:			
Memphis	2	0	0
California:			
Los Angeles	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 1.
Pellagra.—Cases: Boston, 1; Savannah, 2; Birmingham, 3.
Typhus fever.—Cases: New York, 2; Miami, 2.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague.—Rats proved positive for plague have been found in Hamakua District, Island of Hawaii, as follows: Hamakua Mill area, December 2, 1940, 2 rats; December 3, mass inoculation of 12 rats and 1 mouse; Honokaa, December 14, 1 rat; Paauhau, December 2, 1 rat; December 9, 1 rat; December 11, 2 rats; December 18, 2 rats.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 14, 1940.—During the week ended December 14, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	2	1	3	3	1	1	4	2	18
Chickenpox	-	10	4	222	484	47	95	104	71	1,037
Diphtheria	-	19	2	37	4	3	2	1	-	68
Dysentery	-	-	-	3	-	-	-	-	-	3
Influenza	-	1,419	-	-	143	37	60	-	516	2,175
Measles	-	214	2	84	397	124	477	81	146	1,525
Mumps	-	-	-	101	103	44	7	15	8	278
Pneumonia	-	15	-	-	18	3	1	-	17	54
Poliomyelitis	-	-	-	-	-	-	-	-	1	1
Scarlet fever	-	13	2	117	91	14	7	6	20	270
Tuberculosis	-	26	3	68	52	5	21	-	-	175
Typhoid and paratyphoid fever	-	-	-	28	4	-	2	-	1	35
Whooping cough	-	-	1	330	162	8	30	13	15	559

DENMARK

Notifiable diseases—July–September 1940.—During the months of July, August, and September 1940, cases of certain notifiable diseases were reported in Denmark as follows:

Disease	July	August	September	Disease	July	August	September
Cerebrospinal meningitis	4	3	1	Measles	2,132	904	964
Chickenpox	503	314	407	Mumps	64	68	55
Diphtheria	74	48	79	Paratyphoid fever	12	8	7
Dysentery	45	71	44	Poliomyelitis	2	4	6
Epidemic encephalitis	1	4	3	Puerperal fever	13	23	15
Erysipelas	212	244	224	Scarlet fever	444	494	586
Gastroenteritis, infectious	3,182	3,893	2,542	Syphilis	35	48	42
German measles	314	179	160	Tetanus neonatorum	2	2	4
Gonorrhea	639	777	734	Typhoid fever	1	4	4
Influenza	1,979	2,280	2,905	Undulant fever	44	52	41
Malaria	-	1	-	Weil's disease	-	4	2
				Whooping cough	1,313	1,626	1,401

FINLAND

Communicable diseases—4 weeks ended November 2, 1940.—During the 4 weeks ended November 2, 1940, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	246	Poliomyelitis	54
Influenza	1,524	Scarlet fever	464
Paratyphoid fever	142	Typhoid fever	49

SWEDEN

Notifiable diseases—October 1940.—During the month of October 1940, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	4	Poliomyelitis	78
Diphtheria	22	Scarlet fever	1,283
Dysentery	7	Syphilis	39
Epidemic encephalitis	4	Typhoid fever	1
Gonorrhea	952	Undulant fever	7
Paratyphoid fever	37	Weil's disease	3

YUGOSLAVIA

Communicable diseases—4 weeks ended November 3, 1940.—During the 4 weeks ended November 3, 1940, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	55	2	Paratyphoid fever	32	2
Cerebrospinal meningitis	55	19	Poliomyelitis	6	
Diphtheria and croup	715	55	Scarlet fever	282	2
Dysentery	1,046	102	Sepsis	13	3
Erysipelas	171	6	Tetanus	40	18
Favus	11		Typhoid fever	514	38
Lethargic encephalitis	1	1	Typhus fever	10	2

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of December 27, 1940, pages 2408–2412. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Peru.—During the month of November 1940, plague was reported in Peru as follows: Lambayeque Department, 2 cases; Libertad Department, 3 cases; Lima Department, 2 cases, 1 death.

Yellow Fever

Brazil.—For the period February 1 to September 8, 1940, yellow fever was reported in Brazil as follows: Bahia State, 1 death; Espirito Santo State, 112 deaths; Minas Geraes State, 2 deaths; Para State, 1 death; Rio de Janeiro State, 4 deaths; Santa Catarina State, 2 deaths.

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IN THIS ISSUE

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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PRINCIPAL PROVISIONS OF SMALLPOX VACCINATION LAWS AND REGULATIONS IN THE UNITED STATES

By WILLIAM FOWLER, *United States Public Health Service*

There is here presented a comparative analysis of the principal provisions of the existing State laws and health department regulations pertaining to the requirement of vaccination against smallpox. Also included in the study are the laws and regulations of the District of Columbia, Alaska, Hawaii, Puerto Rico, and the United States.[1] Certain provisions, however, contained in the vaccination laws and regulations have not been dealt with herein. These provisions relate to such matters as free vaccination, vaccinating officers or physicians, records and reports of vaccination, vaccination certificates, vaccination history in reporting smallpox cases, vaccination of exposed persons, and the preparation, procuring, distribution, sale, storage, use, etc., of vaccine. The list of citations to the statutes, however, includes all statutory provisions found which expressly relate in any way to vaccination regardless of whether used in this analysis or not. In six States—Arkansas, Florida, Missouri, Nebraska, Nevada, and Oklahoma—no statutes were found which made express or specific reference in any manner to vaccination.

The data are set forth in nine tables, the headings of which are as follows: Vaccination of general population or of particular groups thereof; vaccination as prerequisite to school attendance (regardless of presence or absence of smallpox); exclusion from school of unvaccinated persons during prevalence or threatened prevalence of smallpox; vaccination of employees; vaccination of inmates of institutions; statutory prohibitions relative to vaccination; miscellaneous provisions regarding vaccination; definitions of vaccination; and methods of vaccination. These tables are preceded by a summary table in which are listed the States that have any provisions under any particular table.

[1] The search for the laws has included all of the regular and special sessions for 1939 and the following 1940 sessions: Regular sessions in Kentucky, Louisiana, Mississippi, New Jersey (to July 2), New York, Rhode Island, South Carolina, and Virginia; special sessions in Louisiana, Nebraska, Pennsylvania, and Vermont.

VACCINATION OF GENERAL POPULATION OR OF PARTICULAR GROUPS THEREOF

In this table there are set forth the various provisions relative to the requirement of, or the authority to require, general vaccination. The vaccination of children is required in Hawaii, Kentucky, Maryland, and Puerto Rico. Also, Kentucky has a provision requiring that unvaccinated persons coming into the State to abide or become citizens procure vaccination. Puerto Rico and South Carolina have requirements governing the compulsory vaccination and revaccination of persons generally, but the South Carolina provisions pertain only to persons not residing within an incorporated city or town.

Authority to take action, under varying conditions, relative to general vaccination is conferred in 12 States (Alabama, Connecticut, Georgia, Kentucky, Massachusetts, Mississippi, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia, and Wyoming). The Pennsylvania provisions pertain to second- and third-class cities. In all of these States except Wyoming local authorities are given the power. In South Carolina, in addition to the local authorities, the State board of health is also given authority, while in Wyoming such authority is conferred solely on the State board of health. The language used in Colorado, Michigan, and North Carolina permits, and in New Mexico requires, the making of provision for the vaccination of inhabitants, and miscellaneous provisions having reference to general vaccination are also found in Kansas and South Carolina.

In Connecticut, Hawaii, Maryland, Massachusetts, South Carolina, and Tennessee there are provisions regarding exemption from, or postponement of, vaccination.

VACCINATION AS PREREQUISITE TO SCHOOL ATTENDANCE (REGARDLESS OF PRESENCE OR ABSENCE OF SMALLPOX)

This table deals with those statutes and regulations which require, or authorize the requirement of, vaccination for school attendance. Those requirements or authorizations which are effective only when smallpox is present or threatened have not been included in this table but will be found in the table "Exclusion from school of unvaccinated persons during prevalence or threatened prevalence of smallpox." The language used in the statutes and regulations does not always in terms require, or authorize the requirement of, vaccination, but in classifying the provisions regard has, of course, been had to their effect. For example, in New Jersey the language is "A board of education *may exclude*" a pupil or teacher not successfully vaccinated. For the exact phraseology in any particular jurisdiction recourse must be had to the laws or regulations themselves.

Vaccination is required as a prerequisite to school attendance, regardless of the presence or absence of smallpox, in 12 States (Arkansas, Kentucky, Maryland, Massachusetts, New Hampshire, New Mexico, New York, Pennsylvania, Rhode Island, South Carolina, Virginia, and West Virginia) and in Alaska, the District of Columbia, and Puerto Rico. In Alaska there is the qualification that vaccination is required if, in the judgment of the Territorial health officer, it is necessary for the community's welfare, while in Virginia the operation of the law may be suspended. Pupils[2] are referred to in Alaska, the District of Columbia, Maryland, Massachusetts, New Hampshire, New Mexico, Pennsylvania, Rhode Island, South Carolina, and West Virginia; pupils and teachers in Kentucky and Virginia; pupils, teachers, and employees in Arkansas; pupils, teachers, employees, and caretakers in Puerto Rico; and pupils and persons in New York. With respect to the schools covered, public schools are mentioned in the District of Columbia, Maryland, Massachusetts, New Mexico, Virginia, and West Virginia; public and private schools in Arkansas, Kentucky, New Hampshire, Puerto Rico, and Rhode Island; public, private, parochial, and other schools in Pennsylvania; any school in the State in South Carolina; schools in cities having 50,000 or more inhabitants in New York; and schools in incorporated municipalities and school districts outside incorporated cities in Alaska.

Five States (Connecticut, Georgia, Maine, New Jersey, and Oregon) have statutes empowering school authorities to make vaccination a condition precedent to school attendance. Pupils are referred to in Connecticut, Georgia, and Oregon; pupils and teachers in New Jersey; and persons in Maine. In Connecticut public schools are named, while in Georgia and Oregon the schools are those coming under the particular school board. An Ohio statute authorizes regulations by district boards of education to secure the vaccination of pupils, and, while this statute does not in terms authorize the requirement of vaccination, a regulation under it requiring vaccination has been upheld. South Carolina has a law empowering city or town school authorities to require vaccination, but there are also mandatory vaccination requirements for school attendance in this State.

There are provisions regarding exemption from vaccination in 11 States (Arkansas, Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New Mexico, Pennsylvania, Rhode Island, Virginia, and West Virginia) and Alaska. The grounds for exemption are physical disability or physical condition in Arkansas, Connecticut, Massachusetts, New Mexico, Pennsylvania, and Virginia; unfit subject for vaccination in New Hampshire, New Jersey, and Rhode Island; religious principles in Alaska; opposition to vaccination by the

[2] The term "pupils" has been used generally throughout the analysis even though the statutes or regulations may employ the terms "child" or "children."

parent or guardian in Maine; and impossibility or impropriety of successful vaccination or sufficient reason why vaccination should not be done in West Virginia.

EXCLUSION FROM SCHOOL OF UNVACCINATED PERSONS DURING PREVALENCE OR THREATENED PREVALENCE OF SMALLPOX

As the heading indicates, this table treats of those provisions of the statutes and regulations whose effect is to require, or authorize, the exclusion of unvaccinated persons from school when smallpox is present or threatened. Such matters as the conditions which must exist before the exclusionary requirement or power is called into action and the areas involved vary considerably in the different States and will be found set forth in the table. As to the States concerned, six (Arizona, Kansas, Louisiana, Nebraska, New York, and Wisconsin) require exclusion, while five (Iowa, Minnesota, Montana, North Carolina, and South Carolina) have provisions authorizing exclusion. With respect to New York and South Carolina it may be stated that they also have provisions requiring vaccination as a prerequisite to school attendance, the New York requirement, however, being applicable only in cities of 50,000 or more. Regarding the persons to be excluded, pupils are referred to in Arizona, Iowa, Louisiana, Minnesota, and North Carolina; pupils and teachers in Kansas and Nebraska; pupils and persons in New York; pupils, teachers, and attendants in South Carolina; pupils, teachers, and persons frequenting schoolhouse in Montana; and inhabitants of municipality and nonresidents in Wisconsin.

New Jersey has a statute relative to exclusion, but again it should be noted that this State also authorizes the requirement of vaccination as a condition precedent to school attendance. In Oregon power is given to a board of school directors to decide how far revaccination shall be required if a smallpox case has occurred in the city or district. There is also a statutory provision in Texas bearing on exclusion.

As to exemption from vaccination, a Minnesota statute states that no rule shall require the vaccination of a child whose physician certifies that by reason of his physical condition vaccination would be dangerous.

VACCINATION OF EMPLOYEES

Varying provisions pertaining to the vaccination of specified employees are found in nine States (Colorado, Connecticut, Kentucky, Maine, Massachusetts, Minnesota, New Jersey, Pennsylvania, and Virginia) and Puerto Rico and the United States. Some of these provisions require vaccination (Colorado, Kentucky, Maine, Minnesota, New Jersey, Puerto Rico, and the United States), some authorize

the requirement of vaccination (Massachusetts and Virginia), while others do neither but, nevertheless, relate to the vaccination of employees (Connecticut and Pennsylvania). The employees referred to differ considerably, probationer nurses being mentioned in Colorado; paper-mill employees in Connecticut and Maine; minors and employees generally in Kentucky; various employees in Massachusetts, Pennsylvania, and Puerto Rico; officers and employees in State institutions in Minnesota; certain dairy employees in New Jersey; certain laborers in Virginia; and quarantine station personnel in the United States. In Massachusetts there is a provision regarding the exemption of children because of physical condition.

VACCINATION OF INMATES OF INSTITUTIONS

This table shows eight States (Kentucky, Massachusetts, Mississippi, Montana, New York, North Carolina, Pennsylvania, and South Carolina) as having statutes or regulations relative to the vaccination of inmates of institutions. Of these, six (Kentucky, Mississippi, Montana, New York, North Carolina, and South Carolina) may be classified as requiring that the inmates of the institutions specified be vaccinated, but in North Carolina the statute applies when smallpox appears. In Massachusetts vaccination may be required, and in Pennsylvania the provision relates to the regulations of health departments of first-class cities covering the vaccination of certain inmates. There are considerable differences in the various provisions with respect to the institutions specified, but, since the institutions are listed in the table, they will not be repeated here. Massachusetts has a provision for exemption from vaccination based on the physical condition of a child, and in New York the requirement of vaccination may be waived in an emergency. .

STATUTORY PROHIBITIONS RELATIVE TO VACCINATION

MISCELLANEOUS PROVISIONS REGARDING VACCINATION

DEFINITIONS OF VACCINATION

METHODS OF VACCINATION

These tables classify the remaining data according to the respective headings and do not require further analysis or discussion.

CITATIONS TO SMALLPOX VACCINATION LAWS

State	Citations
Alabama	Michie's Code of 1928, secs. 2032, 2047; 1936 Cumulative Supplement to Michie's Code of 1928, secs. 1058, 1093.
Alaska	Compiled Laws, 1933, secs. 1663, 1677 (as amended by c. 30, act Mar. 10, 1937), 1678, 1682, 1684.
Arizona	Revised Code, 1928, sec. 2693.
California	Deering's School Code, 1937, sec. 3.60; Laws 1939, c. 60, secs. 204, 1600—1621.
Colorado	1935 Statutes Annotated, c. 78, secs. 67, 69.
Connecticut	General Statutes, Revision of 1930, secs. 2392, 2430, 5202; 1935 Cumulative Supplement to General Statutes, sec. 261c.
Delaware	Revised Code, 1935, secs. 746, 774.
District of Columbia	Code, 1929 edition, title 7, sec. 242.
Georgia	Code Annotated, secs. 32-911, 88-416, 88-417, 88-9911; Laws 1937, Act 462, Mar. 30, 1937, sec. 1.
Hawaii	Revised Laws, 1935, secs. 1115—1124.
Idaho	Code, 1932, secs. 38-104, 38-1001—38-1003.
Illinois	Jones Statutes Annotated, secs. 33.168, 126.184.
Indiana	Burns' Statutes Annotated, 1933, sec. 35-712.
Iowa	Code, 1939, secs. 2191, 2220, 6846.
Kansas	General Statutes, 1935, sec. 65-119.
Kentucky	Baldwin's 1936 Revision of Carroll's Statutes, secs. 2052, 2054a-12, 2862, 4608—4614.
Louisiana	Dart's General Statutes, 1939, sec. 3361.
Maine	Revised Statutes, 1930, c. 19, sec. 44; Laws 1933, c. 1, secs. 115 (as amended by Laws 1935, c. 84, sec. 9), 163—169; Laws 1935, c. 84, sec. 12.
Maryland	Flack's Annotated Code, 1939, art. 43, secs. 35, 67—75, 80; art. 77, sec. 114.
Massachusetts	Annotated Laws, c. 76, sec. 15; c. 111, secs. 5, 181—183.
Michigan	Statutes Annotated, secs. 14.41—14.43, 14.106, 14.141, 14.301.
Minnesota	Mason's Statutes, 1927, sec. 5345.
Mississippi	Code of 1930, secs. 4865, 4878; 1938 Supplement to Code of 1930, sec. 1951.
Montana	Revised Codes, 1935, sec. 2481.
New Hampshire	Public Laws, 1926, c. 123, sec. 1 (as amended by Laws 1929, c. 139); c. 133, secs. 1, 3.
New Jersey	Statutes Annotated, Permanent edition, secs. 18: 14-52, 18: 14-53, 26: 4-6—26:4-8, 26: 4-98, 26: 4-99, 26: 4-118.
New Mexico	1938 Supplement to Statutes Annotated, 1929 Compilation, sec. 110-348 (7)—(10).
New York	Baldwin's Consolidated Laws, Lifetime edition, 1938, Public health law, secs. 25, 310, 311.
North Carolina	Michie's Code of 1939, secs. 2796, 7162—7164.
North Dakota	1913—1925 Supplement to 1913 Compiled Laws, secs. 425a1, 425a2.
Ohio	Page's General Code Annotated, secs. 4449, 7686.
Oregon	Compiled Laws Annotated, secs. 99—311, 111—3012.
Pennsylvania	Purdon's Statutes Annotated—Permanent edition, title 53, secs. 2181, 3800-12, 9062, 9069, 12198-2309; title 71, sec. 536.
Puerto Rico	Laws 1912, Act 81, secs. 23, 29.
Rhode Island	General Laws, 1938, c. 198, sec. 8; c. 256, secs. 28—31.
South Carolina	Code of Laws, 1932, secs. 1503, 5009—5013, 5016, 5023, 5028, 5043, 5051, 5066, 5075, 7360—7364.
South Dakota	Code of 1939, secs. 27.0104, 27.2201, 27.2202, 27.9938.
Tennessee	Michie's Code of 1938, secs. 325(1) 5798, 5799.
Texas	Vernon's Annotated Revised Civil Statutes, art. 4477, rules 19, 28.

CITATIONS TO SMALLPOX VACCINATION LAWS—continued

State	Citations
Utah	Revised Statutes, 1933, sec. 35-3-10.
Vermont	Public Laws, 1933, sec. 5299.
Virginia	Michie's Code of 1936, secs. 690, 691, 1505, 1531; 1940 Cumulative Supplement to Michie's Code of 1936, sec. 1493.
Washington	Remington's Revised Statutes Annotated, secs. 4805, 6093, 6094.
West Virginia	Michie's Code of 1937, secs. 1285, 1286.
Wisconsin	Statutes, 1939, secs. 97.68, 143.13.
Wyoming	Revised Statutes, 1931, sec. 103-212.
United States	Code, 1934 edition, title 42, secs. 141—148.

Summary table

State	Vaccination of general population or of particular groups thereof	Vaccination as prerequisite to school attendance (regardless of presence or absence of smallpox)	Exclusion from school of unvaccinated persons during prevalence or threatened prevalence of smallpox	Vaccination of employees	Vaccination of inmates of institutions	Statutory prohibitions relative to vaccination	Miscellaneous provisions regarding vaccination	Definitions of vaccination	Methods of vaccination
Alabama	X								
Alaska		X							
Arizona			X			X			
Arkansas		X						X	
California						X	X		
Colorado	X			X					
Connecticut	X	X		X					
Delaware							X		
District of Columbia		X							
Georgia	X	X					X		X
Hawaii	X								X
Iowa			X				X		
Kansas	X		X						
Kentucky	X	X		X	X				
Louisiana			X						
Maine		X		X					
Maryland	X	X							
Massachusetts	X	X		X	X				
Michigan	X								
Minnesota			X	X		X	X		
Mississippi	X				X				
Montana			X		X				
Nebraska			X					X	
Nevada								X	
New Hampshire		X							
New Jersey		X	X	X					
New Mexico	X	X							
New York		X	X		X		X		X
North Carolina	X		X		X				
North Dakota						X			
Ohio		X						X	
Oregon		X	X						
Pennsylvania	X	X		X	X		X		
Puerto Rico	X	X		X			X	X	X
Rhode Island		X							
South Carolina	X	X	X		X		X		
South Dakota						X	X		
Tennessee	X								
Texas			X						
Utah						X			
Virginia	X	X		X					
Washington						X			
West Virginia		X							
Wisconsin			X						
Wyoming	X								
United States				X			X		

Vaccination of general population or of particular groups thereof

State	Required			May be required			Miscellaneous provisions	
	S or R[1]	Applicable to—	Scope of requirement	S or R[1]	Authority vested in—	Scope of authority	S or R[1]	Scope of provision
Alabama				S	City and town councils.	May provide for system of compulsory vaccination and enforcement of same.		
Colorado							S	Town, city, or county boards of health may make suitable provisions for inoculation of inhabitants with cowpox under direction of local board of health or health officer.
Connecticut				S	Town, city, and borough health officers and boards of health.	May adopt such measures for general vaccination of inhabitants as they deem reasonable and necessary to prevent introduction or arrest progress of smallpox. Fine for refusing to be vaccinated or for preventing person under one's care and control from being vaccinated, on application by health officer or board of health or by physician employed by health officer or board, unless, in another physician's opinion, it would not be prudent on account of sickness.		
Georgia				S	County and municipal authorities.	Empowered to enact ordinances or regulations to authorize proper officials of counties or municipalities to require, under penalty, all persons at time located therein to submit to vaccination, in event health officers or proper authorities think it advisable, to prevent spread of smallpox or any other contagious or infectious disease.		

Hawaii	S	Children	Every child to be taken for vaccination to appointed vaccinating officer or to physician within 6 months after birth or at earliest opportunity thereafter. Officer may postpone vaccination should he deem child to be in unfit state.					
Kansas							S	Should smallpox show a tendency to become epidemic, a general and thorough vaccination should be recommended and insisted upon by a municipal or county board of health or health officer.
Kentucky	S	Children	Parents, guardians, and others having care, custody, or control of children shall have them vaccinated and shall have children born hereafter vaccinated within 12 months after birth or after coming under their care, custody, or control.					
	R	do	Every child shall be vaccinated before becoming 1 year of age.					
	S	Unvaccinated persons coming into State to abide or become citizens and unvaccinated children under their care or control.	Such persons entering State shall procure vaccination of themselves and said children within 6 months after coming into State.					
				S	City councils and town boards of trustees.	Empowered to make such ordinances and regulations, with fines and penalties attached, as will secure vaccination of all inhabitants of cities and towns.		
Maryland	S	Children	It is duty of parent and guardian to have his child vaccinated within 12 months after birth, if in proper condition, or as soon thereafter as practicable.					

[1] Statute or regulation.

Vaccination of general population or of particular groups thereof—Continued

State	Required			May be required			Miscellaneous provisions	
	S or R	Applicable to—	Scope of requirement	S or R	Authority vested in—	Scope of authority	S or R	Scope of provision
Maryland—(Continued).	S	Unvaccinated persons, other than infants, under parent's or guardian's control or care.	Parent or guardian shall cause person to be vaccinated before November 1 of each year.					
Massachusetts				S	Town boards of health.	Shall require and enforce vaccination and revaccination of all inhabitants of their towns, if in their opinion it is necessary for public health or safety.	S	Following persons not subject to foregoing: (1) Person over 21 presenting certificate of a probate court register that person is under guardianship; and (2) child presenting certificate of registered physician, designated by parent or guardian, that he has at time of giving certificate personally examined child and is of opinion that child's physical condition is such that his health will be endangered by vaccination—while such condition continues.
Michigan							S	Townships may make suitable provision for inoculation of inhabitants with cowpox under direction of township board of health or health officer.
Mississippi				S	County boards of supervisors	Empowered, in counties where smallpox exists, to pass ordinances for providing for compulsory vaccination, and to enforce same as provided.		
New Mexico							S	State department of public health shall make suitable provision for inoculation of inhabitants of State with cowpox vaccine under directions of district health officers.

North Carolina				S	City, town, or incorporated village governing body.	May cause all persons in city, town, or village limits to be vaccinated.	S	Board of health of any city, town, or county may make such regulations and provisions for vaccination of inhabitants as it may deem necessary to protect public health.
Pennsylvania				S	Department of public health in second-class cities.	May take such measures as it may deem necessary to prevent spread of smallpox by issuing order requiring all persons in city or any part thereof to be vaccinated within such time as it shall prescribe.		
				S	Board of health of third-class cities.	May take measures for general and gratuitous vaccination as in its opinion protection of public health may require.		
Puerto Rico	S	All inhabitants of island	Inoculation of vaccine virus is made obligatory and binding during such period and under such form and interval of time as is determined by director of sanitation.					
	R	Children	Vaccination required during age period 3 months to 1 year; if unsuccessful it shall be repeated at end of a month and, if second operation is unsuccessful, shall be repeated at end of the year; children who have had smallpox during this period need not be revaccinated. Revaccination required at age 7 years; if unsuccessful it shall be repeated at end of a month and, if still unsuccessful, shall be done from ninth to tenth year.					
	R	Successfully vaccinated persons under 20 years.	Revaccination required 8 years after last vaccination and, if unsuccessful, again at end of a month.					
	R	Persons over 25 years	Revaccination required only on outbreak of smallpox in island which appears to threaten epidemic.					

Vaccination of general population or of particular groups thereof—Continued

State	Required: S or R	Required: Applicable to—	Required: Scope of requirement	May be required: S or R	May be required: Authority vested in—	May be required: Scope of authority	Miscellaneous provisions: S or R	Miscellaneous provisions: Scope of provision
Puerto Rico—Continued.	R	Persons residing in house or locality where smallpox cases exist.	Vaccination or revaccination required unless it can be proved to entire satisfaction of sanitary authorities that said persons have been successfully vaccinated or revaccinated within 3 years before outbreak.	---	---	---	---	
South Carolina	R	Persons not residing within incorporated city or town, except persons obtaining reputable physician's certificate that vaccination would be dangerous to health [rule I].	Vaccination and revaccination by duly appointed agents of State board of health required during first, sixth, and fifteenth year of age; vaccination forthwith required of all perons who have never been vaccinated, or shall be exposed, or are likely to become exposed [rule I].	S	Council of incorporated city or town [Code, sec. 5009].	May provide by ordinance for vaccination and revaccination of all citizens and residents excepting such persons as obtained reputable physician's certificate that vaccination would be dangerous to health. Such ordinances shall establish periods of time, satisfactory to State board of health, within which vaccination and revaccination shall be required; shall provide for vaccination and revaccination of indigent at city's or town's expense; and shall establish penalties by quarantine and otherwise of persons convicted of neglect or refusal to obey ordinances [Code, sec. 5009].	S	State board of health has general direction and supervision of vaccination and revaccination in all cities and towns and, in case of threatened smallpox epidemic in any community with insufficient ordinances, shall request passage of new city or town ordinance framed in accordance with sec. 5009 of code.[2]
							S	If council of any incorporated city or town neglects or refuses to pass ordinance in accordance with sec. 5009 of code[2] it is duty of State board of health to promulgate regulations for vaccination of citizens and residents of city or town.
				S	State board of health and its duly appointed representatives	Empowered to order and enforce vaccination of all such persons as it may consider necessary for preservation of public health, but any exposed person refusing vaccination shall not be forcibly vaccinated but, in board's or agent's discretion, quarantined and guarded until incubation period has passed.	S	State board of health has control in matters of vaccination and revaccination of all persons not residing within any incorporated city or town and shall promulgate regulations for vaccination and revaccination of such persons containing provisions similar to those of sec. 5009 of code[2] applying to ordinances, but requirements may be modi-

								fied in case of sparsely settled communities so as only to apply during apprehended danger of smallpox epidemics.
							S	It is duty of parent, guardian, or other person charged with care of any child to see that child is vaccinated so often as directed by ordinance of incorporated city or town where child resides or by State board of health regulations if not resident of city or town.
							R	It is duty of parent, guardian, or other person charged with care of any child not a resident of an incorporated city or town to see that child is vaccinated as often as required by rule I.[3]
Tennessee				S	Municipal and county health officers or boards or departments of health.	May adopt such measures for general or local vaccination of inhabitants as they deem proper and necessary and, whenever necessary, vaccinate such inhabitants to prevent introduction or arrest progress of smallpox without being authorized or ordered by State department of public health. Fine for refusing to be vaccinated or for preventing person under one's care and control from being vaccinated, on application by health officer or board of health or by physician employed by health officer or board, unless, in another physician's written opinion, it would not be prudent on account of sickness. Fine for physician fraudulently giving certificate of sickness or of vaccination to prevent vaccination.		

[2] South Carolina. For sec. 5009 see this table under subhead "May be required."
[3] South Carolina. For rule I see this table under subhead "Required."

Vaccination of general population or of particular groups thereof—Continued

State	Required			May be required			Miscellaneous provisions	
	S or R	Applicable to—	Scope of requirement	S or R	Authority vested in—	Scope of authority	S or R	Scope of provision
Virginia	---	---	---	S	Local boards of health	May provide for compulsory vaccination if, in their opinion, it be necessary to prevent epidemic.	---	
Wyoming	---	---	---	S	State board of health	May adopt such measures for general vaccination of inhabitants of any city, town, or county as it deems proper and necessary to prevent introduction or arrest progress of smallpox. Unlawful to refuse to be vaccinated, or to prevent person under one's care and control from being vaccinated, or to fail to present oneself to county health officer or practicing physician, acting under board's or county health officer's direction, for vaccination if physician believes vaccination necessary.	---	

Exclusion from school of unvaccinated persons during prevalence or threatened prevalence of smallpox

State	S or R[1]	Exclusion required	Exclusion authorized	Persons excluded	Time of exclusion	Schools to which applicable	Other provisions
Arizona	S	X		Unvaccinated pupils	Period in which smallpox epidemic may be prevalent in school district.	Public schools in any school district.	
Iowa	S		By board of health in city under special charter, with council's consent, by notice served upon teachers or persons in charge of schools.	Pupils	When smallpox is prevalent in city or its vicinity, until pupils have proved to satisfaction of board, or persons selected by it, that they have been vaccinated within 5 years or within such time as board may designate.	Public and private	
Kansas	R	Local board of health or health officer of any city or county where smallpox is present in any school district or part thereof, included in such city or county, shall, with advice and consent of State board of health (or its executive officer), prohibit attendance.[2]		Pupils and teachers who have not been successfully vaccinated.	Period of 25 days after smallpox appears.[2]	In any school district or part thereof previously referred to.	
Louisiana	R	X		Pupils not presenting reputable physician's certificate of successful vaccination within 5 years or of 2 unsuccessful attempts to vaccinate within 1 year.	When smallpox prevails in any parish or municipality and majority of parish or municipal board of health has recommended vaccination of pupils.	Public—in any parish or municipality previously referred to.	

[1] Statute or regulation.
[2] Kansas. Should new cases continue to develop in district or part thereof after expiration of 25 days, the local board of health or health officer shall, upon advice and consent of State board of health (or its executive officer) renew order for another period of 25 days or so many days thereof as State board (or executive officer) may deem necessary.

Exclusion from school of unvaccinated persons during prevalence or threatened prevalence of smallpox—Continued

State	S or R[1]	Exclusion required	Exclusion authorized	Persons excluded	Time of exclusion	Schools to which applicable	Other provisions
Louisiana—Con.	R	X		Pupils not furnishing certificate of registered Louisiana physician stating date of last vaccination and stating either that pupil has been successfully vaccinated within 5 years or has been twice vaccinated unsuccessfully within 1 year	When smallpox has been declared prevalent in any parish by State or parish board of health and vaccination of pupils recommended by majority of parish board of health.	Public—in any parish previously referred to.	
Minnesota	S		No rule of State board of health or of any public board or officer shall exclude, except during smallpox epidemics and when approved by local board of education, a child from public schools because unvaccinated.	Pupils	During smallpox epidemics.	Public	Person thus required to be vaccinated may select any licensed physician and no rule shall require vaccination of child whose physician certifies that by reason of his physical condition vaccination would be dangerous.
Montana	S		By State board of health	All persons frequenting schoolhouse who do not comply with requirement of vaccination or presentation of evidence of successful vaccination with cowpox.	When smallpox exists or is threatened.	Any schoolhouse in infected or threatened district.	
	R		When smallpox exists or is threatened in any school district or part thereof, State board of health, (or, in interim of meetings, its executive officer) may direct local or county health officer to prohibit attendance.[3]	Pupils and teachers who have not been successfully vaccinated.	Period of 3 months after appearance of smallpox.[3]	School in any school district or part thereof previously referred to.	

Nebraska	R	Duty of school board to make order.		Pupils and teachers.	When smallpox epidemic exists in a community or one case or more exists among children who have attended school while suffering with disease in eruptive stage.	"School" only is specified.	
New Jersey	S						Anybody having control of public schools may, on account of prevalence of, or to prevent spread of, communicable disease, prohibit attendance of any unvaccinated child who has not had smallpox, and decide whether revaccination shall be required if a smallpox case occurs in city or district.
New York	S	Duty of school authorities in charge of school to exclude.		Pupils and persons not furnishing duly licensed physician's certificate that he has successfully vaccinated such child or person with vaccine virus in usual manner or that such child or person shows evidence by scar of successful previous vaccination.	When smallpox exists in any other city than one having 50,000 or more inhabitants or school district, or in vicinity thereof, and State health commissioner certifies in writing to school authorities in charge of any school or schools in such city or district.	Schools in city or school district previously referred to.	
North Carolina	S		By any town, city, or county board of health.	Pupils not presenting certificate of immunity from smallpox either through recent vaccination or previous attack of disease.	On appearance of smallpox case in any neighborhood, town, or city.	Public.	
Oregon	S						Any board of school directors has power to decide how far revaccination shall be required if smallpox case has occurred in city or district.

[3] Montana. Should new cases continue to develop in district or part thereof after expiration of 3 months, order may be renewed for another period of 3 months or so many days thereof as State board of health (or its executive officer) may deem necessary.

Exclusion from school of unvaccinated persons during prevalence or threatened prevalence of smallpox—Continued

State	S or R[1]	Exclusion required	Exclusion authorized	Persons excluded	Time of exclusion	Schools to which applicable	Other provisions
South Carolina	S		By school trustees or other body having control of any of schools in any city or town.	Pupils, teachers, and attendants.	When smallpox case has occurred in city or town.	Any school in city or town.	
Texas	S						School wherein child suffering from smallpox has been present may, if board of trustees has passed regulation requiring successful vaccination of all teachers and pupils, be reopened immediately after disinfection and cleaning under local health authority's supervision, and all successfully vaccinated teachers and pupils may return.
Wisconsin	S	Local board of health shall prohibit attendance.[4]		Inhabitants of municipality and nonresidents not successfully vaccinated or showing doctor's certificate of recent vaccination.	Period of 14 days upon appearance of smallpox.[4]	"School" only is specified.	

[4] Wisconsin. Should new cases continue to develop in municipality, local board of health shall renew order for so many days as State board of health may deem necessary.

Vaccination of employees

State	S or R[1]	Required	May be required	Persons to whom applicable—	Other provisions
Colorado	R	Immediately upon entrance upon duties, if not successfully vaccinated within 5 years.		Probationer nurses in any hospital or sanatorium.	
Connecticut	S				Any person who employs in manufacture of paper any person who has not had smallpox or been vaccinated shall pay to any town all expenses caused it by sickness of such person with smallpox contracted while so employed.
Kentucky	S	Persons who may have minors in their employ shall have them vaccinated.		Minor employees.	
	R	Employers shall require each employee to be vaccinated previous to employment unless proof is furnished of successful vaccination within 5 years or that employee has had smallpox.		Each employee for any kind of service.	Anyone employing person in violation of rule is guilty of separate offense for each day that such employee is sick with smallpox and liable for cost of his maintenance.
Maine	S	Successful vaccination or revaccination within 2 years or to local health officer's satisfaction required for employment in paper mills using rags in manufacture.		Persons hired or admitted to work in or about said paper mills.	Said paper mills required annually in February and September to make out and deliver to local health officer a list containing names, ages, kind of work, and places of residence of all employees; annually in March and October said employees shall be examined by local health officer as to whether they are successfully and sufficiently protected by vaccination and said officer is judge of sufficiency of such protection.
Massachusetts	S		Board of health of town where any incorporated manufacturing company, infirmary, training or industrial school, hospital or other establishment where poor or sick are received, prison, jail or house of correction, or any institution supported or aided by State, is situated may, if it decides it is necessary for health of employees or inmates or for public safety, require authorities of said establishment or institution, at expense thereof, to cause all said employees or inmates to be vaccinated	Employees of incorporated manufacturing companies and probably those of the institutions specified.	Child presenting certificate of registered physician, designated by parent or guardian, that he has at time of giving certificate personally examined child and is of opinion that child's physical condition is such that his health will be endangered by vaccination is not, while such condition continues, subject to provisions.

[1] Statute or regulation

Vaccination of employees—Continued

State	S or R	Required	May be required	Persons to whom applicable—	Other provisions
Minnesota	R	Successful vaccination required when brought into contact in any way with wards of institution.		Officers and employees in State institutions.	
New Jersey	R	Employment prohibited when not vaccinated within 5 years, as confirmed by filing of proper certificate of vaccination, unless revaccinated at time of employment.		Employees on dairies producing certified milk.	
Pennsylvania	S				Regulations of health departments of first-class cities shall cover and include the compulsory vaccination and revaccination of persons employed as physicians, teachers, nurses, or in any other capacity in public or private schools, hospitals, and asylums, or any other public or private educational or charitable institutions.
Puerto Rico	R	Specified employees required to have vaccination or revaccination certificate.[1]		Employees of railroads, tramways, and vehicles at public's service; stevedores of steam and sailing vessels; proprietors and clerks of hotels, restaurants, and other commercial establishments; managers and operatives of workshops and factories; members of police force; inspectors, internal revenue appraisers, and other employees whose occupation brings them in contact with public.	
Virginia	S		In examining officer's discretion, laborers shall be vaccinated.[2]	Laborers constructing works of public improvement.[2]	
United States	R	Quarantine station personnel shall be vaccinated.		Personnel at all U. S. Public Health Service quarantine stations.	

[1] Puerto Rico. See table "Vaccination of general population or of particular groups thereof" for provisions concerning vaccination and revaccination by age groups.

[2] Virginia. The statutory section involved commences by requiring any person, firm, or corporation employing large bodies of laborers constructing works of public improvement, unless having own physician for purpose, to have a regular inspection by board of health of the counties where said laborers are employed at such times as board may determine.

Vaccination of inmates of institutions

State	S or R[1]	Institutions specified	Requirement as to vaccination	Exemption from vaccination
Kentucky	S	Charitable institutions of State	Superintendents shall have all inmates vaccinated.	
	S	Penitentiary	Keeper shall have all convicts in same vaccinated.	
Massachusetts	S	Any infirmary, training or industrial school, hospital or other establishment where poor or sick are received, prison, jail or house of correction, or any institution supported or aided by State.	Board of health of town where situated may, if it decides it is necessary for health of inmates or for public safety, require authorities of said establishment or institution, at expense thereof, to cause all said inmates to be vaccinated.	Child presenting certificate of registered physician, designated by parent or guardian, that he has at time of giving certificate personally examined child and is of opinion that child's physical condition is such that his health will be endangered by vaccination—while such condition continues
Mississippi	S	Sunflower Farm	Prison physician at said farm shall cause all convicts to be vaccinated.	
Montana	R	State Vocational School at Helena, State Industrial School at Miles City, State School for Feeble-minded and School for Deaf and Blind at Boulder, and State Orphans' Home at Twin Bridges	On admission to said institutions all children must show evidence of successful vaccination or be immediately vaccinated.	
New York	R	State Reconstruction Home at West Haverstraw	A patient shall not be considered eligible for admission unless successfully vaccinated within 3 years.	Superintendent authorized to waive requirement when in his judgment emergency exists requiring immediate admission of patient.
North Carolina	S	A public institution, jail, or county home	On appearance of smallpox case in any neighborhood the county physician or health officer shall vaccinate every person admitted as soon as practicable, unless satisfied upon examination that person is already successfully vaccinated.	
Pennsylvania	S	Public or private schools, hospitals and asylums, or any other public or private educational or charitable institutions.	Regulations of health departments of first-class cities shall cover and include the compulsory vaccination and revaccination of inmates.	
South Carolina	R	Any jail or other penal institution	Prisoners not successfully vaccinated within 10 years shall be vaccinated upon admission.	

[1] Statute or regulation.

Statutory prohibitions relative to vaccination

State	Action prohibited or made unlawful
Arizona	Subjecting minor child to compulsory vaccination without parent's or guardian's consent.
California	Adoption by school or local health authorities of any rule or regulation on the subject of vaccination.
Minnesota	Rule of State board of health or of any public board or officer compelling vaccination of child or excluding, except during smallpox epidemics and when approved by local board of education, child from public schools because unvaccinated.
North Dakota	Making any form of vaccination or inoculation a condition precedent for admission to any public or private school or college of any person, or for exercise of any right, performance of any duty, or enjoyment of any privilege by any person.
South Dakota	For any board, physician, or person to compel another, by use of physical force, to submit to operation of vaccination with smallpox or other virus.
Utah	For any board of health, board of education, or any other public board to compel by resolution, order, or proceedings of any kind the vaccination of any person of any age; or to make vaccination a condition precedent to attendance at any public or private school, either as pupil or teacher.
Washington	Requiring children to submit to vaccination against parents' or guardian's will.[1]

[1] Washington. This provision is contained in a proviso in par. No. 13 of sec. 4805, Remington's Revised Statutes Annotated, which section enumerates various powers of the board of directors of a first-class school district.

Miscellaneous provisions regarding vaccination

State	S or R[1]	Scope of provision
California	S	Control of smallpox shall be under direction of State board of health.
Delaware	S	State board of health authorized to make such regulations and adopt such measures, including vaccination, as it deems best efficient to eradicate all infectious diseases.
Georgia	S	Boards of health of counties having 200,000 or more inhabitants authorized to make rules relative to vaccination.
Iowa	S	When smallpox is prevalent in city under special charter or its vicinity the city board of health, with council's consent, may prevent admission of persons not furnishing satisfactory proof of vaccination into churches, theaters, or other buildings by notifying persons in charge thereof not to admit such persons.
Minnesota	S	By regulation State board of health may control assembling, during smallpox epidemics, with other persons not vaccinated.
New York	S	No person shall perform vaccination who is not a regularly licensed physician under laws of State.
Pennsylvania	S	Regulations of health departments of first-class cities shall cover and include the compulsory vaccination and revaccination of persons attending public or private schools, hospitals and asylums, or any other public or private educational or charitable institutions.
Puerto Rico	R	Vaccination shall be practiced only by physicians, "practicantes" and nurses, or by persons outside medical profession obtaining vaccinator's license from director of sanitation.
South Carolina	S	Board of health of incorporated city, town, or village has power and it is its duty to of enforce vaccination.
	S	Boards of health of unincorporated towns and villages of not less than 100 population have power and it is their duty to enforce vaccination.
	R	Every midwife shall be successfully vaccinated
South Dakota	S	No person shall prevent child of school age who furnishes physician's certificate of successful vaccination with smallpox virus, within 5 years, from attending public school.
United States	R	Persons from localities in Canada and Mexico where smallpox is prevailing shall not be allowed entry into United States without vaccination, unless protected by previous attack of disease or recent successful vaccination.

[1] Statute or regulation.

Definitions of vaccination [1]

State	Definition
Arkansas	Introduction of vaccine virus into the skin.
Nebraska	Scarification or puncture of the skin and introduction therein of active principles of cowpox followed by characteristic lesion or scar.
Nevada	Introduction, through an abrasion of the skin, of bovine vaccine virus.
Ohio	Inoculation by incision, puncture, scarification, or injection beneath epidermis of a vaccine which produces, with some constitutional disturbance, the typical vaccine vesicle and which leaves, after pock has healed, a characteristic scar.
Puerto Rico	Transference to human being of virus from irruption on skin of susceptible animal suffering from vacuna or cowpox.

[1] These definitions are all contained in regulations.

Methods of vaccination

State	S or R[1]	Scope of provision
Georgia	S	Misdemeanor to use any inoculation other than that called vaccination, unless by special commission or authority from court of ordinary of county where smallpox appears.
Hawaii	S	In vaccination of children, only bovine virus obtained from standard manufacturers shall be used, vaccination shall be only by scarifier and points put up in hermetically sealed tubes or other antiseptic receptacles, each receptacle shall be opened immediately before a scarifier or point is to be used in presence of person to be vaccinated, and no scarifier or point shall be used for vaccination of more than 1 person.
New York	S	Vaccination shall be performed in such manner only as prescribed by State health commissioner.
	R	One of following methods shall be used, unless special permission for use of another method is obtained from State health commissioner: (a) Single scratch method; (b) multiple pressure method. Following methods are specifically disapproved (a) Cross hatching, (b) multiple scratches, or scarifications, less than 1 inch apart, (c) scratches more than ¼ inch in length.
Puerto Rico	R	Only mode employed shall be by puncture, incision, or scraping by means of sterilized needles, glass, or ivory points or scalpel, taking care not to cause flow of blood or unnecessary skin irritation; scarification should not be crossed nor should dry points be used

[1] Statute or regulation.

PROCEDURE FOR THE MAINTENANCE OF HOUSING STANDARDS IN MILWAUKEE [1]

By CHARLES L. SENN, *Assistant Chief in Charge of Sanitary Inspection, Milwaukee Health Department*

How far should housing concern the health department? This question has been posed many times, most recently at the American Public Health Association Convention in Detroit in October 1940. For the purpose of this article, the question may be rephrased: How far does housing concern the health department in Milwaukee?

Sufficient evidence has been accumulated to show that there is a definite relationship between housing and health. It appears to be agreed, generally, that housing is a concern of all health departments, and that health departments in the routine conduct of their duties do many things of immediate, practical value in maintaining reasonable dwelling standards in the communities which they serve.

But to what extent are defects in housing the direct responsibility of the health department? Who is to enforce existing codes? What about housing for families on relief? Should a housing authority or commission be created within the municipal administration? Should the building inspection department be made responsible? Will the Federal housing programs solve the problem? Should new codes be adopted?

It is clear that no two cities are going to solve their housing problems in exactly the same way; nor will they draw upon the same agencies for cooperation. Enforcement of laws relating to healthful

[1] Acknowledgment is made of the many helpful suggestions and assistance given by Mr. J. O. Leukhardt of the United States Public Health Service, in the preparation of this article.

housing will not be accomplished in the same ways by various municipal agencies.

The solution of problems encountered in the broad field of urban housing involves the combined work of several departments and agencies—zoning commissions, park and playground departments, building departments, relief and social agencies, fire prevention bureaus, plumbing departments, and health departments.

In Milwaukee, the plan now in effect joins together the city's health and housing functions. This coordination is attempted through the defining and sharing of responsibility on the part of several agencies.

It is true that the codes and rules applicable to the situation are still inadequate. Nevertheless, through fair and impartial enforcement and through mutual action by the building inspection department and the health department, progress is being made.

Discussion of some of the housing problems arising in Milwaukee and of the steps taken toward their solution will serve to show what one city is doing to raise the level of housing standards.

ROOMING HOUSES AND "LIGHT HOUSEKEEPING" ROOMS

The shift, a few years ago, of the "best residential" section from large homes in the central city to the newer suburban areas, left many large residences unoccupied. These have been taken over by tenants who desired to use them for the establishment of rooming houses and for light housekeeping rooms.

Thus, a number of families have come to live under one roof, sharing bathrooms and laundries, and cooking their meals in rooms originally intended only for sleeping purposes. These light housekeeping rooms are used largely by persons financially unable to establish homes in apartments, houses, or flats. To rent the usual dwelling unit would require a considerable outlay of money on their part. They would have to pay 1 month's rent in advance, to pay deposits to gas and electric companies, and to provide furniture. In light housekeeping rooms, by paying 1 week's rent in advance, they can obtain completely furnished living quarters within their means, including cooking facilities, heat, light, and gas.

These light housekeeping places present a housing problem in terms of crowding, safety, and sanitation. In 1917 an ordinance was adopted requiring that whenever four or more persons, in addition to the operator's family, live in a building not actually divided into complete, individual apartments, a rooming house license must be obtained from the health department. Licensing under this code requires at least 400 cubic feet of air space per adult occupant, window

areas of at least one-tenth the floor areas, and one toilet for each eight occupants.

Reasonable rules and regulations were decided upon, giving the health department power to require installation of a certain number of baths or showers and to exact on the part of the landlord a certain amount of cleanliness, the extermination of vermin, and the provision of clean, sanitary bedding.

A license to operate a rooming house is not issued until the occupancy permit is granted by the building inspection department and until all the rules of the health department have been complied with. Application for a license makes it possible to locate the houses and to keep records of the manner in which they are operated. Licensing also assists in enforcement since, each year before the license is renewed, compliance with all codes under the jurisdiction of the health department can be insisted upon. Following the routine health department check-up, lack of adequate fire escapes, installation of improper or illegal plumbing or wiring, and accumulation of material which might create a fire hazard, are called to the attention of proper departments. The health department withholds licenses when rooms on third floors do not have proper exits and fire escapes, although enforcement of this regulation is actually a building inspection department function.

It was soon realized that, even with frequent inspection and rigid enforcement, it would be difficult to maintain satisfactory housing in places having several light housekeeping units.

In May 1939, at the suggestion of the building inspector, Milwaukee's building code was changed to prohibit the installation or creation of new "nonregulation" dwelling units. That is to say, all new dwelling units to be used for sleeping and cooking purposes are required to have a minimum of 280 square feet of floor area, an individual sink, and at least one complete bathroom for each two units. This law is not retroactive.

Following passage of this code, the sanitary inspectors of the health department made a rooming house survey. All nonregulation dwelling units in existence at the time of passage of the new ordinance (i.e., units which met requirements of the rooming house law but not those of the new building code) were investigated. Sanitary facilities available in each place, the total number of nonregulation dwelling units, the number of persons living in such units, and the amount of rent paid were noted. At the time of the survey there were in Milwaukee 11,774 nonregulation dwelling units occupied by 19,462 persons. The total rooming house population was about 30,000.

These data were recorded on a card for each rooming house. Thus, at the annual inspection, the number of units recorded for each building may be checked against the number allowable. If units have

been added during the year, the owner is ordered to remove the stove and cooking facilities and to reserve the rooms for sleeping purposes only.

One of the most objectionable features of light housekeeping has been the lack of adequate means for procuring and disposing of water. One clause in the new ordinance has made possible the alleviation of such conditions to a marked degree. Under this clause, a sink must be installed in each dwelling unit. Occupants need not obtain all water from the bathroom if there is running water available to them in their own living quarters, nor do they have to dispose of all waste water by returning it to the bathroom. It is possible to wash and shave within their own rooms, and the inevitable long waits where a great many people are using the same bathroom are avoided. Unfortunately, this clause is not retroactive.

Upon adoption of the new ordinance, enforcement of all existing provisions was pressed. Places having more than the allowable number of persons for each toilet were ordered to install additional toilets or to reduce the number of roomers. Many rooms, which had been rented and licensed for a period of years, had insufficient window area. These were ordered vacated until the window area could be increased to comply with the ordinance. Units on third floors having but one stairway were no longer licensed. Inside rooms having no windows and rooms that were too small for healthful use were ordered vacated. Operators were required to install at least one bath or shower for every 15 persons. Violations of fire and safety regulations were promptly referred to the building inspection department.

Places regularly found to be in good condition are now inspected but once a year. Special records are kept of those houses requiring frequent inspection. Since State regulations require a special electric rate for rooming houses, an interchange of rooming house lists with the local electric company assists in keeping track of new places and of changes in ownership.

In order to secure uniform interpretation and enforcement of the rules and ordinances, all rules and policies of the health department are given to inspectors in written form. The city is divided into 16 inspection districts. All inspectors are required to investigate the rooming houses in their districts. Inspectors best qualified for housing work are assigned to the districts in which most of the rooming houses are located. One additional inspector is assigned exclusively to rooming house inspection.

In 1937 a complete check of all the buildings in the city was made by the police department. This check revealed only 25 unlicensed rooming houses at a time when there were 2,500 licensed rooming houses in the city.

Changes and improvements are accomplished with very little opposition; it is rarely necessary to bring an offender into court.

HOUSING STANDARDS FOR PUBLIC ASSISTANCE FAMILIES

An important factor in the Milwaukee procedure for improving housing standards has been the close cooperation of the department of public assistance with local enforcement agencies.

The department of public assistance of Milwaukee County[2] has shown a keen interest in the housing problem of families receiving assistance. It has aided materially in bringing about housing improvements by insisting that rooms which are too small, which have inadequate window areas, or which lack fire exits are not to be occupied by relief clients. This department routinely has refused to rent units in rooming houses which are not licensed by the health department.

The housing division of the department of public assistance permits clients to find their own quarters within the limits of their budget. The rent is paid directly to the landlord by the county. Rents are paid according to a definite evaluation schedule, and no place is rented until complete investigation has been made by the housing division.

Dwelling units are classified, in order that the maximum amount of rent allowable may be determined. The rates are established according to the availability of water, gas, electricity, inside toilets, private toilets, and like facilities. Quarters are further considered with reference to the number of rooms and the number of persons in the family to occupy them.

Based on these considerations, a maximum rent of $18 per month, for example, would be paid for three rooms to be occupied by three people, if the rooms were equipped with water, gas, electricity, and inside toilet.

Housing investigators of the public assistance department check the buildings for general upkeep, cleanliness, screens, type and quantity of furniture, sanitary facilities, window areas, tightness of windows, type of heating, dampness, condition of basements, attics, stairs, hallways, and other pertinent factors. Deductions are made for each of the points in which the dwelling unit is deficient. A maximum rent allowance can be paid for any place rating between 85 and 100 percent. Rent allowance is proportionately decreased until a rate of 65 percent is reached. No quarters rating at or under 65 percent are rented without referring the premises to the attention of the building inspection department or to the health department for investigation. Once declared unfit by the building inspection department, a place will not be rented by the department of public

[2] See "How can a department of public assistance secure improved housing for client families?" Publication No. N-126, July 1940. National Association of Housing Officials, 1313 East Sixtieth Street, Chicago, Ill.

assistance. If the building is structurally unsafe, it is, of course, condemned by the building inspection department.

Minor defects in one- and two-family places—such as faulty plumbing, leaky roofs, broken windows, and the like—are referred directly to the owner by the housing division of the department of public assistance. When the owner refuses to correct insanitary conditions, the health department investigates. Upon decision that the quarters are unfit for human habitation, the relief department refuses to pay further rent until the conditions are corrected.

Violations of the rooming house law are referred to the health department for enforcement.

Insanitary conditions are not always attributable to the dwellings. Quite frequently conditions detrimental to health are caused by poor housekeeping on the part of the occupants. Heavy vermin infestations in quarters occupied by careless or ignorant housekeepers may result in the health department serving frequent notices to rooming house keepers to clean up and to exterminate the pests. The tenants responsible are usually ordered to move after repeated notices. They may move several times in a single year, and each time they bring vermin to their new rooms.

Many of these families are relief clients and the department of public assistance is now attempting to encourage them to maintain their premises in a reasonably clean and vermin-free condition. A housekeeping instructor visits the offending families and assists them to adopt better methods of housekeeping. In one- and two-family houses where the landlord cannot officially be made responsible for pest control, the visiting housekeeper furnishes clients with exterminating materials and instructions on ridding the rooms of household pests.

HEATING

For healthful occupancy there must be maintained in living rooms a temperature which will avoid "undue heat loss from the human body."[3] An ordinance requiring maintenance of at least 70 degrees of heat, whenever the heat is furnished by the landlord, is enforced by the health department. The majority of houses occupied by multiple family units come under the provisions of this ordinance. Enforcement is by the usual method of education and cooperation, with court cases being the exception rather than the rule.

When complaints are made, inspectors are instructed to find the cause of the lack of heat. Frequently only one or two of the tenants in a building complain. Investigation commonly reveals faulty valves, improper circulating systems within the heating plant, or loss of heat due to loose or broken windows. All such conditions may

[3] Quotation from "Basic principles of healthful housing." Report of Committee on Hygiene of Housing, American Public Health Association.

be corrected readily by the landlord, and usually he is willing to cooperate if the defect is brought to his attention. If the lack of heat seems due to intentional economy or to neglect in caring for the heating apparatus, the landlord is instructed to comply with the provisions of the ordinance. If the orders are not obeyed, recording thermometers are installed in the complainant's quarters. When substandard temperature charts are presented in court, conviction usually follows.

GENERAL SANITATION

Efforts were made to improve sanitary conditions in areas where yards and alley passages were objectionable because of open piles of garbage and refuse. Rats and flies were attracted by the nuisance, and disagreeable odors resulted. Five health department inspectors were assigned to a single area during the summer of 1939 and as many as 100 written orders to clean up were issued in such districts in a single day.

Rat surveys carried out by district sanitary inspectors revealed the areas and buildings which were badly infested. The inspectors encouraged whole neighborhoods to work together for rat control. Thousands of pamphlets were distributed and improvement was brought about by ratproofing and by the elimination of feeding places and rat harborages.

There is still need of further control of dust and odor nuisances and of more strict regulation of city noise. Existing ordinances give the health department ample authority to respond to complaints in connection with these matters. Except in the heavy industrial areas, loud and sharp night noises from industrial plants and construction projects are prohibited. Noises caused by the hum of industrial ventilator fans, unmuffled motors, and compressors can be controlled by the health department. The enforcement of building and zoning laws will do much to prevent the establishment of new residential areas too near the noisy, malodorous, and dust-producing industries. The unnecessary blowing of auto horns is covered by an ordinance enforced by the police department. Certain other unnecessary noises, such as the loud playing of radios and other musical instruments, and noises made by heavy street cars, are still imperfectly restrained.

HOUSES IN OUTLYING SECTIONS

Before certain outlying districts were incorporated in the city limit, numerous individual bungalow-garages were built in these districts by persons who hoped soon to have funds with which to construct permanent homes. During the depression, building and loan companies and finance corporations took over many of these structures

planned by their owners as temporary and makeshift dwellings, and rented them as low-cost housing units.

Health problems soon developed, for with careless tenants occupying a building which had no sink, no inside toilet, and no running water, the improperly placed wells were soon contaminated. There was also the practice on the part of housewives of throwing waste water into the yards, further to complicate sanitary enforcement.

In 1937 a survey was made to determine how many privies, chemical toilets, and private wells were in use by the impoverished families in outlying sections. Orders were issued to install city water and sewer connections on all premises abutting on streets having public sewers and water. Owners who lived on the premises generally complied when orders were issued, even at considerable financial sacrifice. Many of the landlords and corporations, however, failed to comply. A decision by the city attorney held that existing ordinances did not give the health department authority to enforce these orders and more than 100 contemplated orders were dismissed before action was brought.

When the passage of a new ordinance was being considered, companies holding the properties for rental purposes argued that if the building foundations were improved, plumbing installed, and proper connections for running water made, large increases in rent would necessarily follow. This would, in turn, oblige the low rent tenants to move to rooming houses or to more dilapidated buildings in the congested part of the city. Pending adoption of a covering ordinance, the health department is attempting to require flyproof privy vaults, safe water supplies, and reasonable adherence to sanitary conditions. If it is found that such standards cannot be sustained, it is required that water and sewer connections be made or the property be vacated as a health hazard and a nuisance.

TENEMENTS

Places housing three or more families, not classed as rooming houses, are regulated by the tenement house sanitary code. The tenement code authorizes the health department to correct conditions detrimental to health, to order extermination of vermin, to insist upon provisions of sufficient window area in the sleeping rooms, and to prevent overcrowding.

Apartments and tenements are inspected annually by the health department. Additional inspections are made of places usually found in poor condition. While it is doubtful whether inspectors legally can insist on inspection of individual apartments, they do ask the privilege of going through dwelling units in buildings which are obviously in poor condition.

TRAILERS

Although the use of trailers for housing is not usual in Milwaukee, there are several trailer camps and a number of individual trailers in use in the city. An ordinance has recently been adopted requiring use of approved sites and provision of sanitary facilities. Use of trailers for living purposes is forbidden, except on sites accommodating at least 30 trailers. Persons may not occupy a trailer for more than 6 months in a year, within the city.

Occupancy permits for trailer camps must be obtained from the building inspector and annual licenses must be procured from the health department.

CONCLUSION

The new Federal housing policy of making available suitable dwelling places to lower income groups will help only a limited number of persons in a city the size of Milwaukee. For years to come there will exist the need of controlling the housing situation in the congested areas of the city, so that safe places to live, measuring up to known and legally enforceable standards, may be provided for people with low incomes and for families on relief.

Through close cooperation of the health department and the building inspection department, supported by the insistence of the tenants themselves that they be afforded better living accommodations, it is hoped that higher standards will be established, applicable to all existing units.

Improved new units, built under newly established standards, are the result of an extensive educational and enforcement program now in effect in Milwaukee. By clearly defining the duties of the several enforcement agencies, Milwaukee has strengthened the ordinances, and made the housing codes more comprehensive. Through close cooperation between local departments and agencies, improved housing for low income families has been advanced and opportunity for healthful living extended.

COURT DECISION ON PUBLIC HEALTH

Tuberculosis held not to be compensable under workmen's compensation act.—(Massachusetts Supreme Judicial Court; *Smith's Case*, 30 N.E.2d 536; decided December 10, 1940.) The widow of a deceased employee sought compensation under the Massachusetts Workmen's Compensation Act as a dependent. It appeared that the employee was in the service of a municipal hospital for contagious diseases from March 1, 1932, until his death from tuberculosis on January 19, 1938. At times he worked in the tuberculosis ward, taking meals to the patients, removing their dishes, and burning their

sputum boxes. It could be found, according to the supreme court's statement, that in 1934 he contracted tuberculosis. No means of infection other than inhalation of germs was shown. Compensation was awarded in the lower court and the city appealed.

The supreme court stated that the compensation act required only a personal injury, not personal injury by accident, and that the question for decision was whether germs of disease, present because of the employment, result in personal injury when they are inhaled by an employee and perform their function of producing disease. It was declared that the distinction between personal injury and germ disease had to be drawn, for the purposes of the compensation act, in accordance with common understanding as revealed in common speech and that the two concepts at times might overlap. "But," said the court, "when the disability has no cause connected with the employment except the presence, due to the employment, of germs of disease, and those germs find lodgment in the system only through the normal and natural process of respiration or inhalation, we think that there is disease, and not personal injury within the meaning of the act." In the instant case there was no evidence that the channel of infection was other than the nose and mouth into which the germs were carried by the natural act of respiration and the court's view was that the employee suffered from and died of disease, not personal injury.

DEATHS DURING WEEK ENDED JANUARY 18, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 18, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,724	9,368
Average for 3 prior years	9,111	
Total deaths, first 3 weeks of year	28,777	28,334
Deaths under 1 year of age	550	565
Average for 3 prior years	533	
Deaths under 1 year of age, first 3 weeks of year	1,704	1,693
Data from industrial insurance companies.		
Policies in force	64,741,274	66,384,377
Number of death claims	13,858	15,167
Death claims per 1,000 policies in force, annual rate	11.2	11.9
Death claims per 1,000 policies, first 3 weeks of year, annual rate	9.8	10.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 25, 1941

Summary

The incidence of influenza, which has been increasing in the country as a whole since last November, registered a decline for the current week, with 96,652 cases reported as compared with 120,006 [1] for the preceding week. These figures include only New York City for New York State; and while the State health officer of Pennsylvania reports further increase of upper respiratory infection, with scattered cases of influenza, he states that the disease is not epidemic there.

Increases for the current week were shown for only 3 geographic areas—the Middle Atlantic, East North Central, and South Atlantic—with the latter area reporting the largest number of cases and the largest numerical increase, from 46,255 to 50,310, or 52 percent of the current total. West Virginia, with 14,003 cases, as compared with 8,867 last week, reported the highest incidence and the largest increase for any State during the current week. The disease declined sharply in the two South Central and the Mountain and Pacific areas, where the incidence has previously been high.

For the current week the Bureau of the Census reports 10,472 deaths in 88 major cities of the United States, as compared with 9,724 last week and with a 3-year (1938–40) average of 9,321. From November through the week of January 4, mortality in these cities remained below or close to the 3-year average, but for the weeks ended January 11, 18, and 25, the numbers of deaths were 484, 613, and 1,151 above the respective weekly averages.

Of the other 8 communicable diseases included in the weekly table, only measles and poliomyelitis were above the 5-year (1936–40) medians, while the incidence of diphtheria, smallpox, and typhoid fever was below that for each of the preceding 5 years.

Two cases of tularemia were reported in North Carolina and 1 case in Utah. Of 29 cases of endemic typhus fever, 15 cases were reported in North Carolina and 5 cases in Georgia.

[1] The total of 119,006 cases previously recorded for last week was increased by a delayed report of 1,000 in New Hampshire.

Telegraphic morbidity reports from State health officers for the week ended January 25, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Jan. 25, 1941	Jan. 27, 1940		Jan. 25, 1941	Jan. 27, 1940		Jan. 25, 1941	Jan. 27, 1940		Jan. 25, 1941	Jan. 27, 1940	
NEW ENG.												
Maine	0	4	3	1,138	34	34	34	154	143	0	0	0
New Hampshire	0	0	0	44	-----	1	15	6	12	0	0	0
Vermont	0	1	0	23	-----	-----	38	22	22	0	0	0
Massachusetts	3	4	4	-----	-----	-----	341	210	344	0	2	2
Rhode Island	0	0	0	29	-----	-----	2	98	98	1	1	0
Connecticut	1	2	2	1,869	4	6	21	164	164	0	0	1
MID. ATL.												
New York	18	28	33	[1] 522	[1] 16	[1] 21	2,125	212	564	2	3	7
New Jersey	22	1	12	377	32	19	688	28	33	1	0	1
Pennsylvania	6	26	41	-----	-----	-----	2,485	52	140	4	15	9
E. NO. CEN.												
Ohio	8	23	27	3,245	21	7	770	38	60	2	2	3
Indiana	11	20	21	432	25	25	126	16	16	2	1	1
Illinois	14	33	41	171	79	35	1,210	32	32	0	0	5
Michigan	4	9	11	412	12	4	1,199	354	354	0	1	2
Wisconsin	1	3	3	230	64	53	286	214	214	3	1	0
W. NO. CEN.												
Minnesota	3	1	4	954	8	4	7	235	104	0	0	1
Iowa	5	3	6	671	22	7	109	78	78	1	0	0
Missouri	3	3	20	147	26	145	26	4	8	2	1	2
North Dakota	3	2	3	141	42	16	13	6	6	0	0	0
South Dakota	9	0	3	5	4	2	39	5	5	0	0	0
Nebraska	4	5	0	34	-----	1	2	28	28	0	1	1
Kansas	1	4	7	750	142	25	223	213	41	1	0	1
SO. ATL.												
Delaware	1	2	1	392	-----	-----	20	0	11	1	0	0
Maryland [2]	5	2	7	624	132	47	25	7	137	1	0	3
Dist. of Col.	1	4	7	168	19	4	5	1	12	0	0	1
Virginia	6	17	23	12,868	2,107	-----	304	41	135	2	1	4
West Virginia [2]	2	17	17	14,003	53	53	58	4	11	11	1	2
North Carolina [2]	24	10	30	1,277	122	34	87	42	54	2	0	3
South Carolina [2]	8	10	9	11,731	2,160	711	25	11	11	1	0	1
Georgia [2]	2	4	13	9,031	1,249	193	63	24	21	0	0	0
Florida [2]	1	5	10	216	62	13	6	33	33	1	0	0
E. SO. CEN.												
Kentucky	8	13	11	2,450	59	46	164	23	48	2	1	8
Tennessee	5	3	10	3,528	325	185	42	47	47	2	2	3
Alabama [2]	5	12	23	7,043	900	362	81	40	40	2	3	2
Mississippi [2] [3]	2	2	8	-----	-----	-----	-----	-----	-----	1	1	1
W. SO. CEN.												
Arkansas	12	10	10	2,633	1,859	190	63	19	19	2	0	1
Louisiana	4	6	10	660	42	22	1	2	4	0	0	0
Oklahoma	9	8	10	1,521	373	217	5	2	13	1	1	2
Texas [2]	28	35	58	12,841	2,158	719	84	196	75	7	0	8
MOUNTAIN												
Montana	3	0	1	721	9	50	3	32	32	0	2	0
Idaho	0	3	2	79	1	2	0	148	73	0	0	0
Wyoming	2	1	0	616	2	-----	2	10	9	0	0	0
Colorado	1	8	9	603	27	-----	57	27	27	0	0	1
New Mexico	0	0	3	159	19	10	84	9	26	0	0	0
Arizona	4	3	3	528	271	130	106	10	2	1	0	0
Utah [2]	3	0	0	155	45	7	16	149	54	0	1	0
Nevada	0	-----	-----	-----	-----	-----	0	-----	-----	0	-----	-----
PACIFIC												
Washington	2	3	3	110	13	4	82	801	113	1	0	0
Oregon	0	9	2	125	221	53	223	147	22	1	1	1
California	17	24	30	1,376	474	144	83	380	380	2	0	2
Total	271	383	601	96,652	13,242	3,395	11,448	4,383	5,806	60	42	104
4 weeks	1,220	1,829	2,507	383,630	47,956	12,765	40,419	15,633	18,801	166	139	377

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 25, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Jan. 25, 1941	Jan. 27, 1940		Jan. 25, 1941	Jan. 27, 1940		Jan. 25, 1941	Jan. 27, 1940		Jan. 25, 1941	Jan. 27, 1940	
NEW ENG.												
Maine	0	0	0	5	17	21	0	0	0	1	1	1
New Hampshire	0	0	0	4	8	8	0	0	0	0	0	0
Vermont	0	0	0	11	11	11	0	0	0	0	0	0
Massachusetts	0	0	0	149	139	249	0	0	0	1	1	1
Rhode Island	0	0	0	4	8	20	0	0	0	0	0	0
Connecticut	0	0	0	39	82	82	0	0	0	1	10	0
MID. ATL.												
New York	2	0	0	440	597	677	0	0	0	2	6	6
New Jersey	0	0	1	269	256	177	0	0	0	0	0	0
Pennsylvania	2	0	1	283	388	569	0	0	0	2	10	7
E. NO. CEN.												
Ohio	1	1	0	247	376	438	0	1	8	1	0	0
Indiana	0	1	0	157	189	195	2	7	7	3	1	0
Illinois	2	1	1	410	489	551	0	1	17	8	1	3
Michigan	4	0	0	187	317	560	4	0	0	2	2	2
Wisconsin	2	0	0	147	167	289	2	2	13	0	1	1
W. NO. CEN.												
Minnesota	0	2	0	56	125	147	3	13	15	1	0	0
Iowa	5	6	0	56	71	191	7	11	24	4	2	1
Missouri	0	0	0	91	86	210	6	2	10	1	2	2
North Dakota	0	0	0	3	23	28	0	0	10	0	0	0
South Dakota	0	0	0	29	16	21	0	0	4	0	0	0
Nebraska	0	0	0	20	36	47	0	0	2	0	0	0
Kansas	1	1	0	64	114	213	2	0	11	0	0	0
SO. ATL.												
Delaware	0	0	0	13	14	14	0	0	0	0	0	0
Maryland [1]	0	0	0	83	54	57	0	0	0	2	2	2
Dist. of Col.	0	0	0	11	31	16	0	0	0	0	0	0
Virginia	0	0	0	50	68	47	0	3	0	2	3	3
West Virginia [2]	0	2	0	60	60	51	0	0	0	1	0	3
North Carolina [2]	1	0	1	46	48	50	0	0	0	0	0	5
South Carolina [2]	1	1	0	6	7	7	0	0	0	0	2	2
Georgia [2]	3	0	0	25	12	16	0	0	0	1	4	3
Florida [2]	2	0	0	1	6	11	0	1	0	0	0	1
E. SO. CEN.												
Kentucky	4	1	1	66	61	67	0	0	0	7	0	2
Tennessee	0	0	0	93	54	43	1	0	0	5	0	2
Alabama [2]	0	2	1	19	16	14	0	0	0	3	0	2
Mississippi [1] [2]	0	0	0	7	4	4	2	0	0	2	1	1
W. SO. CEN.												
Arkansas	0	0	0	8	13	9	0	2	2	1	3	3
Louisiana	2	0	1	10	18	16	0	0	0	1	3	4
Oklahoma	0	1	0	27	43	48	0	0	1	3	0	1
Texas [2]	1	1	2	46	66	110	1	5	5	6	4	9
MOUNTAIN												
Montana	0	1	0	24	30	35	0	0	7	1	0	0
Idaho	0	1	0	14	4	29	0	0	3	0	7	0
Wyoming	0	0	0	8	14	14	0	0	0	0	0	0
Colorado	0	0	0	20	36	36	12	4	4	2	1	1
New Mexico	0	0	0	6	16	18	2	0	0	2	6	2
Arizona	0	0	0	5	14	14	0	0	0	0	3	0
Utah [2]	1	1	0	6	25	25	0	0	0	0	0	0
Nevada	0	------	------	0	------	------	0	------	------	3	------	------
PACIFIC												
Washington	1	0	0	27	61	74	1	0	10	2	0	0
Oregon	0	0	0	12	46	70	0	0	11	0	0	0
California	2	10	2	112	192	252	1	3	4	1	3	4
Total	37	33	26	3,485	4,528	6,359	46	55	275	72	79	101
4 weeks	170	151	85	12,674	16,488	23,666	190	319	1,144	312	329	458

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 25, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough, Week ended Jan. 25, 1941	Whooping cough, Week ended Jan. 27, 1940
NEW ENG.		
Maine	18	130
New Hampshire	0	7
Vermont	17	139
Massachusetts	250	104
Rhode Island	6	4
Connecticut	89	78
MID. ATL.		
New York	351	405
New Jersey	126	69
Pennsylvania	494	349
E. NO. CEN.		
Ohio	332	80
Indiana	22	23
Illinois	108	85
Michigan	331	102
Wisconsin	149	103
W. NO. CEN.		
Minnesota	49	47
Iowa	15	5
Missouri	42	11
North Dakota	32	0
South Dakota	3	2
Nebraska	2	3
Kansas	93	22
SO. ATL.		
Delaware	21	7
Maryland [2]	87	86
Dist. of Col.	7	1
Virginia	128	21
West Virginia [3]	59	32
North Carolina [3]	218	44
South Carolina [3]	120	8
SO. ATL.—Continued		
Georgia [3]	26	9
Florida [3]	7	5
E. SO. CEN.		
Kentucky	46	84
Tennessee	64	18
Alabama [3]	26	10
Mississippi [2, 3]	----------	----------
W. SO. CEN.		
Arkansas	24	17
Louisiana	7	1
Oklahoma	20	5
Texas [3]	138	60
MOUNTAIN		
Montana	15	5
Idaho	18	6
Wyoming	0	12
Colorado	34	82
New Mexico	39	62
Arizona	10	12
Utah [2]	57	149
Nevada	0	----------
PACIFIC		
Washington	96	29
Oregon	16	29
California	318	166
Total	4,130	2,678
4 weeks	16,857	10,417

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended January 25, 1941, 30 cases, as follows: North Carolina, 15; South Carolina, 2; Georgia, 5; Florida, 1; Alabama, 3; Mississippi, 2; Texas, 2.

WEEKLY REPORTS FROM CITIES

City reports for week ended January 11, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	167	1,078	124	1,872	919	1,540	28	356	20	1,051	--------
Current week [1]	65	5,479	151	4,499	661	640	9	334	16	1,498	--------
Maine:											
Portland	0	2	0	1	3	2	0	0	0	14	20
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	5
Manchester	0	------	0	0	3	12	0	1	0	0	12
Nashua	0	------	--------	0	--------	4	0	--------	0	2	--------

[1] Figures for Hartford, Wilmington, N. C., Shreveport, Boise, and Los Angeles (cases) estimated; reports not received.

City reports for week ended January 11, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	5
Burlington	0	------	0	0	0	0	0	0	0	0	11
Rutland	0	------	0	0	1	0	0	0	0	0	7
Massachusetts:											
Boston	1	------	8	139	37	31	0	10	1	106	316
Fall River	0	------	1	0	0	0	0	4	0	4	34
Springfield	0	------	0	1	1	15	0	0	0	2	42
Worcester	0	------	0	87	17	10	0	3	0	2	75
Rhode Island:											
Pawtucket	0	1	1	0	0	0	0	2	0	0	19
Providence	1	5	1	0	8	3	0	3	0	12	82
Connecticut:											
Bridgeport	0	11	0	0	6	2	0	0	1	1	33
Hartford	------	------	------	------	------	------	------	------	------	------	------
New Haven	0	------	0	0	1	7	0	0	0	25	38
New York:											
Buffalo	0	------	0	72	6	12	0	6	0	32	128
New York	16	94	1	1,390	90	146	0	65	1	187	1,571
Rochester	0	------	0	3	3	1	0	0	1	21	71
Syracuse	0	------	0	0	4	2	0	2	0	9	60
New Jersey:											
Camden	1	1	1	94	8	9	0	1	0	2	35
Newark	0	4	0	99	7	22	0	6	0	22	141
Trenton	1	1	0	3	6	20	0	1	0	2	40
Pennsylvania:											
Philadelphia	1	36	6	612	25	90	0	25	2	115	598
Pittsburgh	1	15	3	5	17	7	0	9	1	67	191
Reading	0	------	0	123	3	0	0	0	0	16	25
Scranton	0	------	------	1	------	1	0	------	0	0	------
Ohio:											
Cincinnati	0	7	2	10	12	9	0	4	0	3	150
Cleveland	1	67	0	239	16	25	0	9	0	89	215
Columbus	1	1	1	13	5	2	0	0	0	19	97
Toledo	0	------	0	2	5	6	0	0	0	27	71
Indiana:											
Anderson	0	------	0	0	0	1	0	0	0	0	7
Fort Wayne	0	1	0	0	4	5	0	1	0	0	38
Indianapolis	10	------	5	8	15	14	0	9	0	10	102
Muncie	0	------	0	1	2	6	0	0	0	0	13
South Bend	0	------	0	1	1	0	0	0	0	0	19
Terre Haute	0	------	1	0	0	0	0	0	0	0	25
Illinois:											
Alton	0	2	0	0	1	2	0	0	0	0	14
Chicago	4	18	1	697	38	153	0	32	0	59	761
Elgin	0	------	0	2	0	0	0	0	0	0	14
Moline	0	------	0	2	0	0	0	0	0	0	10
Springfield	0	------	0	2	7	8	0	0	0	6	24
Michigan:											
Detroit	4	10	1	600	23	105	2	13	0	207	286
Flint	0	------	0	10	4	5	0	0	0	15	35
Grand Rapids	0	1	0	12	7	4	0	1	0	25	40
Wisconsin:											
Kenosha	0	------	0	1	0	0	0	0	0	0	17
Madison	0	------	1	2	0	2	0	0	0	1	21
Milwaukee	0	------	0	28	4	29	0	4	0	28	89
Racine	0	------	0	0	0	3	0	0	0	1	23
Superior	0	------	0	2	1	0	0	0	0	3	10
Minnesota:											
Duluth	0	------	0	0	3	2	5	0	0	7	36
Minneapolis	1	------	1	2	1	12	0	1	0	15	109
St. Paul	0	1	1	0	8	15	0	3	0	26	45
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	0	------
Davenport	0	------	------	0	------	2	0	------	0	0	------
Des Moines	13	------	0	0	0	5	2	0	0	0	37
Sioux City	0	------	------	0	------	3	0	------	0	4	------
Waterloo	3	------	------	1	------	3	0	------	0	3	------
Missouri:											
Kansas City	0	1	4	3	10	5	0	1	0	13	119
St. Joseph	0	------	2	3	2	0	0	1	0	2	29
St. Louis	2	47	0	0	21	36	0	1	1	19	213
North Dakota:											
Fargo	0	------	------	0	------	0	0	------	0	10	------
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	0	0	0	0	0	0	1	7

City reports for week ended January 11, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	1	------
Sioux Falls	0	------	0	0	0	2	0	0	0	0	4
Nebraska:											
Lincoln	1	------	------	2	------	8	0	------	0	1	------
Omaha	0	------	0	2	5	3	1	5	0	0	58
Kansas:											
Lawrence	0	47	0	10	1	0	0	0	0	0	7
Topeka	0	21	0	6	1	2	0	0	0	5	2
Wichita	0	54	1	0	10	2	1	1	0	13	33
Delaware:											
Wilmington	0	------	------	3	2	1	0	0	0	5	35
Maryland:											
Baltimore	4	20	2	8	12	17	0	6	0	55	245
Cumberland	0	------	0	0	0	0	0	0	0	0	12
Frederick	0	------	0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	1	90	0	4	11	22	0	10	2	10	207
Virginia:											
Lynchburg	1	------	0	0	1	0	0	0	0	4	16
Norfolk	0	199	0	5	2	2	0	2	0	1	24
Richmond	0	------	0	2	2	3	0	1	0	0	56
Roanoke	0	------	0	26	3	0	0	0	0	4	21
West Virginia:											
Charleston	0	3	0	0	3	0	0	1	0	0	29
Huntington	1	12	------	2	------	0	0	------	0	1	------
Wheeling	0	------	0	1	3	2	0	0	0	4	14
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	0	4	4	0	0	0	13	10
Wilmington	------	------	------	------	------	------	------	------	------	------	------
Winston-Salem	1	------	1	2	1	0	0	1	0	40	12
South Carolina:											
Charleston	0	267	0	22	5	0	0	1	0	1	23
Florence	0	------	0	0	2	0	0	1	0	0	16
Greenville	1	------	0	0	2	0	0	0	0	6	17
Georgia:											
Atlanta	0	853	11	4	5	3	0	0	0	2	102
Brunswick	0	------	0	0	2	0	0	0	0	0	7
Savannah	0	224	4	1	2	1	0	1	1	1	35
Florida:											
Miami	0	10	1	1	3	2	0	1	1	2	46
Tampa	0	16	1	0	2	0	0	1	1	1	28
Kentucky:											
Ashland	0	85	0	0	0	0	0	2	0	1	6
Covington	0	6	0	11	2	2	0	3	0	0	15
Lexington	0	------	0	53*	4	0	0	1	0	2	20
Tennessee:											
Knoxville	1	3,250	2	1	3	4	0	2	0	0	25
Memphis	1	276	12	19	10	6	0	4	1	4	135
Nashville	0	------	2	3	9	3	0	0	0	4	57
Alabama:											
Birmingham	4	45	4	20	6	2	0	2	0	1	68
Mobile	0	70	3	2	5	2	0	0	0	0	33
Montgomery	0	53	------	3	------	1	0	------	0	0	------
Arkansas:											
Fort Smith	0	51	------	0	------	1	0	------	0	0	------
Little Rock	0	300	1	0	8	1	0	1	0	0	52
Louisiana:											
Lake Charles	1	1	0	0	3	0	0	0	0	0	15
New Orleans	1	50	8	0	13	2	0	11	0	4	162
Shreveport	------	------	------	------	------	------	------	------	------	------	------
Oklahoma:											
Oklahoma City	0	198	0	0	8	1	0	2	0	0	69
Tulsa	0	------	0	0	9	0	0	0	0	2	30
Texas:											
Dallas	0	11	3	0	6	5	0	5	0	1	88
Fort Worth	1	------	1	25	8	2	0	1	1	0	51
Galveston	0	------	0	0	4	0	0	1	0	0	19
Houston	2	1,404	6	0	9	2	0	6	0	0	92
San Antonio	0	16	10	0	19	0	0	11	0	0	97
Montana:											
Billings	0	8	0	0	4	0	0	0	0	0	18
Great Falls	0	34	0	0	5	1	0	0	0	0	15
Helena	0	170	0	0	1	0	0	0	0	0	6
Missoula	0	154	0	0	2	1	0	0	0	0	5

City reports for week ended January 11, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Idaho:											
Boise											
Colorado:											
Colorado Springs	0		0	1	3	1	0	2	0	1	16
Denver	2	191	9	14	14	5	0	6	1	15	112
Pueblo	0		1	0	1	0	0	0	0	0	8
New Mexico:											
Albuquerque	0	16	0	0	2	2	0	3	0	0	12
Utah:											
Salt Lake City	0		0	0	6	2	0	0	0	10	41
Washington:											
Seattle	0		6	1	5	2	0	5	0	3	91
Spokane	0	2	2	0	0	6	0	1	0	1	48
Tacoma	0		6	2	2	0	0	0	0	1	40
Oregon:											
Portland	1	55	1	6	7	3	0	3	0	0	97
Salem	0	66		1		0	0		0	2	
California:											
Los Angeles	3	391	8	5	8	20	0	31	0	52	503
Sacramento	0	15	1	1	6	0	0	3	0	4	38
San Francisco	1	110	4	1	6	7	0	3	1	42	192

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Rhode Island:			
Providence	0	0	1
New York:			
New York	3	1	2
Pennsylvania:			
Philadelphia	0	0	1
Ohio:			
Cleveland	0	0	1
Illinois:			
Chicago	0	0	1
Missouri:			
Kansas City	0	0	1
District of Columbia:			
Washington	0	0	1
Florida:			
Miami	0	0	1
Colorado:			
Denver	1	0	0

Encephalitis, epidemic or lethargic.—Cases: St. Paul, 1.
Pellagra.—Cases: Charleston, S. C., 2.
Typhus fever.—Cases: Raleigh, 2; Brunswick, 1; Savannah, 1; San Antonio, 1. Deaths: New Orleans, 1.

TERRITORIES AND POSSESSIONS

VIRGIN ISLANDS OF THE UNITED STATES

Notifiable diseases—October–December 1940.—During the months of October, November, and December 1940, cases of certain notifiable diseases were reported in the Virgin Islands of the United States as follows:

Disease	October	November	December
Filariasis	1	8	10
Gonorrhea	6	8	7
Hookworm disease	5	5	3
Malaria			1
Measles			1
Pneumonia	1		
Schistosomiasis			1
Syphilis	19	49	17
Trachoma	1		
Tuberculosis	4	4	2

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 21, 1940.—During the week ended December 21, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		10	1	2	9	1			2	25
Chickenpox			3	228	398	50	88	90	74	881
Diphtheria		24		41	1	4	5			75
Dysentery					55					55
Influenza		711			67	49	98		645	1,570
Measles		95	8	65	262	125	76	150	143	930
Mumps				49	52	12	1	13	9	136
Pneumonia		6			17	4			10	37
Scarlet fever		25	4	107	107	10	4	13	18	288
Tuberculosis	1	20	3	63	32	48	1	1		169
Typhoid and paratyphoid fever				29		1				30
Whooping cough			1	161	149	15	19		17	362

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated total are for approximate dates.

Place		January–October 1940	November 1940	December 1940—week ended— 7	14	21	28
ASIA							
Ceylon	C		1				
China:							
Dairen	C	2					
Foochow	C	578	34				
Hong Kong	C	804	44				
Macao	C	488	25				
Manchuria	C	31					
Shanghai	C	563	8				
Shantung Province	C	244					
India	C	43,094					
Bassein	C	104					
Bombay	C	13					
Calcutta	C	2,008					
Cawnpore	C	333					
Chittagong	C	4					
Karachi	C	65					
Madras	C	1					
Moulmein	C	16					
Porto Novo	C	1					
Rangoon	C	43			10	6	2
Vizagapatam	C	21					
India (French)	C	34					
Indochina (French)	C	436					
Thailand	C	235					

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths]

Place		January-October 1940	November 1940	December 1940—week ended—			
				7	14	21	28
AFRICA							
Algeria	C	22					1
Plague-infected rats		2					
Belgian Congo	C	23					
British East Africa:							
Kenya	C	9					
Uganda	C	171					
Egypt	C	[1] 409					
Madagascar	C	489	62	23		10	14
Morocco [2]	C	30					
Rhodesia, Northern	C	1					
Senegal:							
Dakar	D	[3] 1					
Thies	C	1					
Tivaouane	C	3					
Tunisia: Tunis	C	6	4				
Plague-infected rats		1					
Union of South Africa	C	25	[4] 6				
ASIA							
China [5]							
Dutch East Indies:							
Java and Madura	C	325					
West Java	C	8					
India	C	14,438					
Bassein	C	18					
Cochin	C	1					
Plague-infected rats		5					
Rangoon	C	6					
Indochina (French)	C	3	1		1		
Thailand:							
Bangkok	C	3					
Plague-infected rats		2					
Bisnulok Province	C	3					
Chingmai	C	3					
Dhonpuri Province	C	1					
Jayanad Province	C	3					
Kamphaeng Bajr Province	C	29					
Kanchanapuri Province	C	12					
Koan Kaen Province	C	5					
Nagara Svarga Province	C	30					
Noangkhay Province	C	4					
Sukhodaya Province	C	22					
EUROPE							
Portugal. Azores Islands	C	2	1				
SOUTH AMERICA							
Argentina:							
Catamarca Province	C	8					
Cordoba Province	C	[6] 32	4				
Jujuy Province	C	9					
La Rioja Province	C	1					
Salta Province	C	8					
San Luis Province	C	1					
Santiago del Estero Province	C	79	1				
Tucuman Province	C	21					

[1] Includes 5 cases of pneumonic plague.
[2] A report dated May 11, 1940, also stated that there was an epidemic of bubonic plague in southern Morocco where several hundred cases had been unofficially reported.
[3] Imported.
[4] Pneumonic.
[5] Information dated July 7 states that up to July 6, 17 cases of plague had been reported near Tungliao, Hsingan Province, China; and a report dated July 13 states that an outbreak of bubonic plague occurred along the Yunnan-Burma border in the districts of Loiwing, Chefang, Juili, and Muchieh. Information dated Aug. 17 states that 45 cases of plague with 36 deaths have occurred in Nungen District and a telegram dated Oct. 2 states that 15 cases of bubonic plague with 3 deaths occurred in Hsinking, Manchuria. During the week ended Nov. 16, 1940, an epidemic of bubonic plague was reported in Ningpo District, Chekiang Province, China.
[6] Includes 15 cases of pneumonic plague.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths]

Place		January-October 1940	November 1940	December 1940—week ended—			
				7	14	21	28
SOUTH AMERICA—continued							
Brazil:							
Alagoas State	C	9					
Pernambuco State	C	4					
Ecuador: El Oro Province	C	6					
Peru:							
Cajabamba Department	C	1					
Cajamarca Department	C	28					
Lambayeque Department	C	13	2				
Libertad Department	C	49	3				
Lima Department	C	54	2				
Piura Department	C	6					
Tumbes Department	C	[7] 20					
OCEANIA							
Hawaii Territory: Plague-infected rats		43	1	[8] 3	4	2	1

[7] Includes 3 suspected cases.
[8] During the week ended Dec. 7, a mass inoculation of 12 rats and 1 mouse was also reported.

SMALLPOX

[C indicates cases; D, deaths]

Place		January-October 1940	November 1940	Dec. 7	Dec. 14	Dec. 21	Dec. 28
AFRICA							
Algeria	C	5	1				
Angola	C	103					
Belgian Congo	C	3,343					
British East Africa	C	54					
Dahomey	C	71	10				8
French Guinea	C	13	3				
Gibraltar	C	[1] 1					
Ivory Coast	C	113	18				1
Nigeria	C	2,146					
Niger Territory	C	599	41			11	2
Nyasaland	C	73	1				
Portuguese East Africa	C	1					
Rhodesia:							
Northern	C	6					
Southern	C	225	15				
Senegal	C	145	4				11
Sierra Leone	C	10					
Sudan (Anglo-Egyptian)	C	522	7				8
Sudan (French)	C	1	2				
Union of South Africa	C	106					
ASIA							
Arabia	C	255					
China	C	831	2				
Chosen	C	541					
Dutch East Indies—Sabang	C	4					
India	C	154,740					
India (French)	C	5					
India (Portuguese)	C	20					
Indochina (French)	C	1,436	51				[2] 42
Iran	C	177					
Iraq	C	617	157	20			
Japan	C	500	1				
Straits Settlements	C	1					
Sumatra	C	1					
Thailand	C	189	12			2	
EUROPE							
Great Britain	C	2					
Greece	C	23					
Portugal	C	354					
Spain	C	756	20				
Turkey	C	139					

[1] Imported.
[2] For the month of December.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths]

Place		January–October 1940	November 1940	December 1940—week ended— 7	14	21	28
NORTH AMERICA							
Canada	C	9	3	2	3		
Guatemala	C	35					
Mexico	C	55					
SOUTH AMERICA							
Bolivia	C	288					
Brazil	C	3					
Colombia	C	1,730					
Ecuador	C	1					
Peru	C	212					
Venezuela (alastrim)	C	194	19		5		

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January–October 1940	November 1940	December 1940—week ended— 7	14	21	28
AFRICA							
Algeria	C	1,819	146				[1] 181
Belgian Congo	C	1,210					
British East Africa	C	2					
Egypt	C	3,615	21				
Eritrea	C	40					
Morocco	C	277					
Rhodesia, Northern	C	7					
Tunisia	C	515	24	25	60		8
Union of South Africa	C	154		6			
ASIA							
China	C	2,127	17				
Chosen	C	359					
India	C	3					
Indochina (French)	C	2					
Iran	C	233					
Iraq	C	156	2				
Japan	C	2					
Palestine	C	175	29				
Straits Settlements	C	10					
Sumatra	C	[2] 1					
Trans-Jordan	C	15					
EUROPE							
Bulgaria	C	145	9	1			
Germany	C	213					
Greece	C	37	2	1	1	1	1
Hungary	C	78			1		
Irish Free State	C	10					
Lithuania	C	115					
Rumania	C	1,259	27	10	21	42	44
Spain	C	14					
Turkey	C	519					
Yugoslavia	C	282					
NORTH AMERICA							
Guatemala	C	281	20				
Mexico	C	199	3	1			
Panama Canal Zone	C	3					
SOUTH AMERICA							
Bolivia	C	626					
Chile	C	312					
Ecuador	C	2					
Peru	C	988					
Venezuela	C	12					
OCEANIA							
Australia	C	11					
Hawaii Territory	C	22	4	2			

[1] For the month of December.
[2] For the month of July.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-October 1940	November 1940	December 1940—week ended— 7	14	21	28
AFRICA							
Belgian Congo: Yatolet	C		1				
Cameroon: Nkongsamba	C	[1] 1					
French Equatorial Africa: Fort Archambault	C	[1] 1					
Gold Coast	C	1					
Ivory Coast	C	[2] 5		[1] 1			
Nigeria:							
Ibadan	C	1					
Oshogbo	C	[1] 1					
Sudan (Anglo-Egyptian): Kordofan Province [3]	C		773				
Sudan (French): Segou	C		[1] 1				
Togo (French)	C	1					
SOUTH AMERICA							
Brazil:							
Bahia State	D	1					
Espirito Santo State	D	[4] 140					
Minas Geraes State	D	2					
Para State	D	1					
Rio de Janeiro State	D	[5] 5					
Santa Caterina State	D	2					
Colombia:							
Antioquia Department—San Luis	D	2					
Caldas Department—							
La Pradera	D	1					
Samana	D	1					
Victoria	D	1					
Intendencias and Commissaries	C	1					
Meta Department	D	3					
Municipality of Jesus Maria	D	1					
Santander Department	D	3					

[1] Suspected.
[2] Includes 3 suspected cases.
[3] A report dated November 13, 1940, states that 8,000 cases of yellow fever with 800 deaths have been reported in Kordofan Province, Anglo-Egyptian Sudan.
[4] Includes 28 deaths from jungle type.
[5] Includes 1 death from jungle type.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

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Public Health Reports

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QUALIFICATIONS OF PROFESSIONAL PUBLIC HEALTH PERSONNEL [1]

III. NURSES

By MAYHEW DERRYBERRY, *Senior Health Education Analyst*, and GEORGE CASWELL, *United States Public Health Service*

Nurses make up the largest single professional group engaged in public health work. They assist in all medical services rendered by official health departments and carry major responsibility for specific health education through home visiting. Inasmuch as these activities are both essential functions of health departments and require time-consuming work with individuals, a large number of nurses is employed to carry them on. It is not surprising, therefore, that, in a survey of the qualifications of professional public health personnel in official health departments, 7,931 of the 16,670 schedules submitted from the 1,114 jurisdictions covered should come from nurses. Although no data are available on the exact number of nurses employed in the reporting jurisdictions at the time of the survey, it is believed that schedules were received from practically all the nurses. Since 97 percent of all jurisdictions having full-time health officers are included in the survey, the sampling represents at least 95 percent of public health nurses working for such jurisdictions.

Administrative classification of nurses.—In accordance with the plans discussed in the first two papers of this series, individual nurses are classified for the analysis into two administrative functional groups, i. e., supervisory and staff nurses. The 128 directors of public health nursing bureaus who returned schedules have been included with those reporting as superintendents or supervisors to make up the group designated as supervisory nurses. Included in the classification "staff nurses" are all field and clinic nurses, school nurses, and 14 nurse trainees. Table 1 shows the number in each group by employing jurisdiction. Throughout the subsequent analysis, data for the 7,900 cases will be presented separately for both the administrative and the jurisdictional classifications if the differences between the several groups justify it.

[1] From Division of Public Health Methods, National Institute of Health. This is the third in the series. Qualifications of Professional Public Health Personnel Preceding papers are:

I. Plan and Scope of the Survey. Pub Health Rep., 55: 2312 (1940).

II. Health Officers and Other Medical Personnel. Pub. Health Rep., 55: 2377 (1940).

For details on the method of conducting the survey and the completeness of the sample, see the first paper.

This survey was made possible through the cooperation of State and local health officers and members of their staffs throughout the country. Assistance in the preparation of these materials was furnished by the personnel of the Works Progress Administration, Official Project No. 765-23-3-2.

TABLE 1.—*Nurses in 1,114 jurisdictions, by employing jurisdiction and type of position held*

Employing jurisdiction	All nurses		Supervisory nurses [1]		Staff nurses [2]	
	Number	Percent	Number	Percent	Number	Percent
Total	7,900	100.0	833	100.0	7,067	100.0
State	1,186	15.0	251	30.1	935	13.2
County or district	2,846	36.0	214	25.7	2,632	37.3
City	3,868	49.0	368	44.2	3,500	49.5

[1] Includes directors of nursing bureaus, superintendents, and supervisors.
[2] Includes all field and clinic nurses, school nurses and "nurse trainees."

Nearly half the nurses considered here are employed in city health departments. Of the remainder, there are two and one-half times as many in counties as in State departments. Approximately one-tenth of the group as a whole are supervisors; however, as would be expected, the proportion among State employees is twice as large as among the county and city nurses, since many State employees act as consultants to or supervisors of local staffs.

Color.—Nurses in health departments are predominantly white. About 9 percent of the nurses are other than white and 5 percent are Negroes. The ratio of white to Negro nurses, although less than that of the two races in the general population, is much nearer the ratio available for employment.

TABLE 2.—*Age of nurses, by type of position held*

Age	All nurses		Supervisory nurses		Staff nurses	
	Number	Percent	Number	Percent	Number	Percent
Total	7,900	100.0	833	100.0	7,067	100.0
Under 25	333	4.2	7	0.9	326	4.6
25–29	1,515	19.2	65	7.8	1,450	20.5
30–34	1,493	18.9	110	13.2	1,383	19.6
35–39	1,194	15.1	131	15.7	1,063	15.1
40–44	1,153	14.6	156	18.7	997	14.1
45–49	885	11.2	126	15.1	759	10.7
50–54	605	7.7	123	14.8	482	6.8
55–59	360	4.5	59	7.1	301	4.3
60–64	147	1.9	25	3.0	122	1.7
65 or over	53	.7	9	1.1	44	.6
Unknown	162	2.0	22	2.6	140	2.0
Average	38.6		43.2		38.1	

Age.—The average age of nurses in official full-time departments is nearly 39 years. Supervisory nurses average 43 years of age, 5 years older than their staffs. It might also be pointed out that 25 percent of staff nurses, but fewer than 9 percent of administrative nurses, are under age 30. There would seem, therefore, to be a greater tendency here than was found among physicians [3] to assign positions with administrative responsibility to older workers. Nurses in city depart-

[3] See "Health Officers and Other Medical Personnel," the second in this series of papers.

ments are 5 years older than State and county employees, both of which groups average 36 years of age. The distribution of nurses by age and jurisdiction is shown in figure 1 and that by age and functional classification in table 2.

EDUCATIONAL QUALIFICATIONS

The nursing profession has not yet standardized basic requirements for entrance to professional training schools. A great deal is being done by organizations such as the National Organization for Public

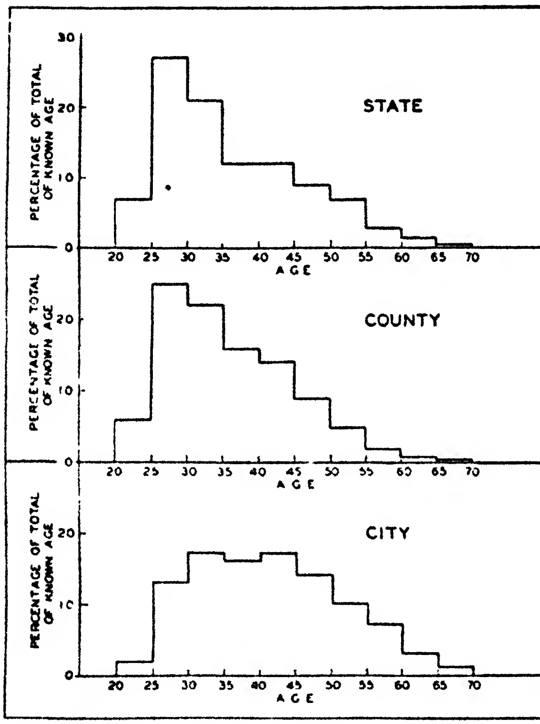

FIGURE 1.—Age of public health nurses, by employing jurisdiction.

Health Nursing and the League for Nursing Education to accomplish this, but schools of nursing throughout the country do not yet conform to a uniform standard. For this reason, one cannot assume that nurses have a specified minimum basic training before they begin their professional work, as was done in discussing the training of physicians. For example, among the 7,900 nurses studied (table 3), almost one-fourth did not report graduation from high school. Some did not report any high school training, but no determination of the number has been made for the table. Almost half of the group graduated from high school, but have no further academic experience. More than one-quarter have had some college work but only 9 percent have college degrees. Only 35 nurses have graduate degrees.

TABLE 3.—*Level of academic training reported by nurses, according to administrative and jurisdictional classifications*

Level of academic training reported	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,846	3,868
Not graduated from high school	1,818	168	1,650	264	410	1,144
High school graduation only	3,654	313	3,341	552	1,387	1,715
Some college training:						
2 years or less, no degree	1,459	150	1,309	185	556	718
3 years or more, no degree	292	43	249	47	125	120
Bachelor's degree [1]	550	124	426	118	311	121
Graduate training	127	35	92	20	57	50
	Percentage					
Total	100 0	100 0	100.0	100.0	100 0	100 0
Not graduated from high school	23 0	20 2	23 3	22 3	14 4	29 6
High school graduation only	46.3	37.6	47.3	46.5	48.7	44.3
Some college training:						
2 years or less, no degree	18 4	18.0	18 5	15 6	19 6	18 6
3 years or more, no degree	3.7	5 1	3 5	4 0	4 4	3 1
Bachelor's degree [1]	7.0	14 9	6 0	9 9	10 9	3 1
Graduate training	1.6	4 2	1 4	1.7	2 0	1 3

[1] Includes those with professional degrees

In this connection it might be pointed out that the college work that nurses take is apparently pointed more directly toward their professional training than that taken by physicians, for two-thirds of the nurses with college degrees graduated in science rather than in the arts.

Supervisory nurses have a much better educational background than those in staff positions, and State and county nurses as a whole have more academic training than city nurses. Part of this jurisdictional difference is accounted for by the larger proportion of staff nurses in cities, though the better training of the county employees probably indicates an attempt to meet the need for superior personnel where immediate supervision is frequently not available.

Comparison with some of the previous surveys of the training of public health nurses indicates a gradual improvement in the educational background of the personnel. It is unfortunate that the data on 1,973 nurses presented in the White House Conference Reports [3] were not presented in the terms used in the other surveys summarized. In attempting to make these comparable in table 4, it has been assumed, as it was in the present survey, that the group reported as "unspecified" at any level did not have the training in question. No such assumptions were necessary in utilizing the material from the National Organization for Public Health Nursing study in 1934 [4]

[3] Public Health Organization, vol. IIA, Reports of the White House Conference on Child Health and Protection. The Century Co., New York, 1932.

[4] Survey of Public Health Nursing by the National Organization for Public Health Nursing. The Commonwealth Fund, New York, 1934.

and from Marian Randall's study for the Organization in 1937,[5] inasmuch as their data on training were reported in the manner that is used in the present survey.

TABLE 4.—*Academic education of public health nurses, summary of four surveys*

Level of college training reported	Survey and year			
	United States Public Health Service, 1938	Randall,[1] 1937	National Organization for Public Health Nursing,[2] 1934	White House Conference,[3] 1932
	Percentage	*Percentage*	*Percentage*	*Percentage*
Total	100	100	100	100
None	69	88	82	80
Not graduated from high school	23	6	47	40
High school graduation only	46	82	35	40
Less than a degree	22	1	17	17
Bachelor's degree	9	11	1	3
Number of nurses included	7,900	917	405	1,973

[1] From table 2, page 46, Personnel Policies in Public Health Nursing, prepared for the Committee on Personnel Practices in Official Agencies of the National Organization for Public Health Nursing by Marian G Randall. It should be noted that some of the nurses in this study are board of education nurses, and for that reason the bases are not entirely comparable. It is also true that 8 out of the 917 nurses did not report training

[2] Adapted from table 7, page 65, Survey of Public Health Nursing by the National Organization for Public Health Nursing. It should be noted that the percentages apply only to nurses employed by departments of health

[3] Data from table 2, page 274, of Public Health Organization, vol IIA, Reports of the White House Conference on Child Health and Protection. The White House Conference Reports on training did not state the findings in terms of levels of college training but rather summarized elementary education, secondary education, and college training separately In putting the percentages in the form that is used here, the assumption has been made that those who did not attend college had only high school education In view of the fact that the White House Conference data and the National Organization for Public Health Nursing data agree quite closely in the essentials, it is believed that the assumptions are tenable The data for the White House Conference Reports were also confined to nurses working in official public health agencies.

The sampling in the White House Conference survey and the present one may be considered directly comparable. The National Organization for Public Health Nursing survey was based only on field nurses. Randall's sample contains a much higher proportion of directors and supervisors than is found in the present survey. Taking these limitations into account, it is obvious from the table that there has been considerable progress toward more adequate training of public health nurses since 1930.

Professional training.—In addition to the academic education summarized above, 54 supervisory and 287 staff nurses reported from 1 to 4 years of professional training in fields other than nursing or public health. The form of the schedule did not require specifications as to the type of training and it is, therefore, only in occasional instances that definite information on the point is available. However, in many cases the professional training reported was in medical or premedical work. Because of the relatively small numbers involved, no detailed tabulation of the amount of such training has been made.

[5] Personnel Policies in Public Health Nursing. Prepared for the Committee on Personnel Practices in Official Agencies of the National Organization for Public Health Nursing by Marian G. Randall. Macmillan, New York, 1937.

In order to obtain a more accurate estimate of the whole educational equipment of nurses, the number of years spent in academic, professional, and nursing education has been determined for each nurse and the results combined to produce table 5.[6] Almost two-thirds of the nurses have had only 3 years of training, usually their nursing training, with no other educational work beyond high school. On the whole, supervisors have had more years of training than their staffs; and county nurses have had more academic education than either of the other two jurisdictional groups. Among city nurses (mostly staff workers), are 303 of the 456 cases with less than 3 years of training and the majority of those whose total amount of training is unknown.

It is assumed that all the nurses have taken the training necessary to become graduate nurses, even though 227 (2.9 percent) did not report registration. The majority of these cases are probably omissions in reporting. No separate tabulation has been made of the number of years in nursing school, inasmuch as ways of reckoning nursing training are known to vary considerably among institutions. It is equally well recognized that prerequisites required by institutions vary, although schools requiring college work prior to entrance are in the minority. The schedules give no evidence as to the relative number of nurses who were graduated from accredited schools of nursing.

TABLE 5.—*Total years of training* [1] *reported by nurses*

Total years of training reported	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,846	3,868
2	456	51	405	43	110	303
3	4,903	431	4,472	767	1,647	2,489
4	778	69	709	97	290	391
5	571	63	508	69	233	269
6	347	56	291	63	168	116
7	456	109	347	89	255	112
8	81	19	62	19	41	21
9 or more	52	17	35	6	19	27
Unknown	256	18	238	33	83	140
	Percentage					
Total	100.0	100.0	100.0	100.0	100.0	100.0
2	5.8	6.1	5.7	3.6	3.9	7.8
3	62.1	51.7	63.3	64.7	57.9	64.4
4	9.8	8.3	10.0	8.2	10.2	10.1
5	7.2	7.6	7.2	5.8	8.2	7.0
6	4.4	6.7	4.1	5.3	5.9	3.0
7	5.8	13.1	4.9	7.5	8.9	2.9
8	1.0	2.3	.9	1.6	1.4	.5
9 or more	.7	2.0	.5	.5	.7	.7
Unknown	3.2	2.2	3.4	2.8	2.9	3.6

[1] Includes academic, nursing, and professional education. "Professional education," as used here, specifically excludes both nursing training and public health training.

[6] In table 5, differences in high school education are not considered.

Public health training.—Half the nurses in public health departments have had some public health training and one out of six has had as much as a year. These proportions are approximately the same as those shown in an earlier paper for the medical personnel. The major difference between the public health training of nurses and that of physicians is in the proportion reporting only "special courses." Relatively many more physicians than nurses report having had only special courses but fewer physicians report having had training in an accredited graduate school of public health.

In the course of analyzing the public health training data, it was discovered that many nurses had reported training of less than a year's duration as "special courses." Accordingly, all nurses' schedules were reviewed by two public health nursing consultants of the Public Health Service who are familiar with the field; and, in all cases in which it was possible to determine at what institutions individuals had been trained, the recording was corrected. The category "special courses" has, therefore, been restricted to "in-service field courses of short duration" in table 6, as elsewhere in the study. Although there was no evidence in the data to indicate that similar reporting errors had been made by physicians, it is possible that such errors did occur, which would account in part for the difference in the proportion who have had only special courses.

TABLE 6.—*Public health training reported by public health nurses, distribution by administrative and jurisdictional classifications*

Public health training reported	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,816	3,898
None	4,021	300	3,721	466	1,149	2,406
Special courses only	680	100	580	124	167	389
Less than 1 semester	1,025	97	928	98	500	427
1 semester, less than year	833	93	740	209	412	212
1 year or more	1,267	230	1,037	273	585	409
Graduate training, unspecified [1]	74	13	61	16	33	25
Certificate	863	121	742	148	435	280
Degree	65	43	22	37	21	7
	Percentage					
Total	100.0	100.0	100.0	100.0	100.0	100.0
None	50.9	36.0	52.6	39.3	40.4	62.2
Special courses only	8.6	12.0	8.2	10.5	5.9	10.1
Less than 1 semester	13.0	11.6	13.1	8.3	17.6	11.0
1 semester, less than year	10.5	11.2	10.5	17.6	14.5	5.5
1 year or more	16.1	27.6	14.7	23.0	20.5	10.6
Graduate training, unspecified [1]	.9	1.6	.9	1.3	1.1	.6
Certificate	10.9	14.5	10.5	12.5	15.3	7.2
Degree	.8	5.2	.3	3.1	.7	.2

[1] All evidence leads to the belief that this training is less than a year's course.

In general, the differences in public health training between supervisory and staff nurses and between nurses employed in the several types of jurisdictions are similar to those shown for academic training. Supervisory nurses have more public health training than their staffs; nurses in city jurisdictions have less than those in States and counties. Only 8 in 1,000 nurses have degrees in public health. Among the 65 nurses who report degrees in public health, 37 are bachelors of science in public health. Twenty-six have master's degrees in public health or are masters of science with a major in public health. One nurse is a doctor of public health and another is a doctor of philosophy with a major in public health.

The reporting of certificates is more difficult to interpret because of the wide variation in the requirements for a certificate. It cannot be assumed that those reporting certificates have all passed accredited courses. In this connection it may be well to point out that the category "graduate training, unspecified" in table 6 is one not previously used in this series of papers. Each of the 74 individuals reporting an unspecified amount of graduate training also reported a "certificate." All available evidence leads to the belief that the training reported was less than a year's course but there is not enough information to permit a decision as to whether it was more or less than one semester.

Although half the nurses engaged in the special field of public health have no other training than that obtained in their basic nursing course, the present situation represents a definite advance over that revealed by the White House Conference in 1930, when 60.4 percent of those who reported on their public health training[7] had had no such training and only 9.0 percent had had one year or more. Similar improvement is shown over the results obtained in the survey by the National Organization for Public Health Nursing which showed that only 8 percent had completed an accredited course leading to a certificate or a degree. The categories are not exactly comparable but are sufficiently so to make the comparison valid. On the other hand, the data in table 6 are widely at variance with Randall's finding in 1937 that 85 percent of her sampling of 917 nurses had had some public health nursing courses and that 29 percent had a public health nursing certificate. The reason for this wide divergence is not altogether evident in the material. It will be recalled that a similar divergence was evident in the comparison of college training reported in table 4.

Although no comparable data on the public health training of nurses in 1935 (the year in which funds were made available for training personnel under the Social Security Act) are available, some evidence

[7] In the above, the 11.5 percent who failed to specify the amount of their public health training have been excluded from the computations. If the more likely assumption were made—that those failing to report public health training had none—the improvement of the situation now over 1930 would be even greater.

of the stimulus given to training by the Act may be obtained by comparing the training of those employed in their present positions prior to 1935 (old employees) and those employed in their present positions since that date (new employees). Thus, if those employed prior to 1935 were sent away for training and returned to the same job, they are classified in table 7 as "new employees."

TABLE 7.—*Comparison of public health training levels among public health nurses, by recency of employment*

Personnel classification	All nurses		Public health training reported							
			None		Special courses only		Less than 1 year [1]		1 year or more	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All nurses	7,900	100.0	4,021	50.9	680	8.6	1,932	24.5	1,267	16.0
Old employees [2]	4,462	100.0	2,595	58.2	447	10.0	895	20.0	525	11.8
New employees [3]	3,438	100.0	1,426	41.5	233	6.8	1,037	30.1	742	21.6
State nurses	1,186	100.0	466	39.3	124	10.5	323	27.2	273	23.0
Old employees	431	100.0	209	48.5	64	14.8	95	22.1	63	14.6
New employees	755	100.0	257	34.0	60	8.0	228	30.2	210	27.8
County nurses	2,846	100.0	1,149	40.3	167	5.9	945	33.2	585	20.6
Old employees	1,047	100.0	492	47.0	69	6.6	326	31.1	160	15.3
New employees	1,799	100.0	657	36.5	98	5.4	619	34.5	425	23.6
City nurses	3,868	100.0	2,406	62.2	389	10.1	664	17.1	409	10.6
Old employees	2,984	100.0	1,894	63.5	314	10.5	474	15.9	302	10.1
New employees	884	100.0	512	57.9	75	8.5	190	21.5	107	12.1

[1] For the purposes of this comparison, "graduate training unspecified" is considered less than 1 year although certificates were reported in each case.
[2] Includes all reporting continuous employment in present position for 3 years or more.
[3] Includes all reporting appointment to present position within 3 years (1935-1938).

As shown in table 7, the proportion of new workers with as much as one year of public health training is twice as great as that of old workers. Similarly, the proportion with less than one year of graduate public health work is greater among the recently employed group. Furthermore, differences are much more pronounced among State and county nurses than among those employed in cities. In this connection, it should be recalled that a large proportion of the training funds have been expended on State and county personnel, and expansion in public health has been largely in State and county units.

There is evident, however, a tendency to appoint young workers with no formal public health training. An analysis of public health training by age, shown in table 8, demonstrates this point. Fifty-five percent of all nurses under 25 report no public health training. In this, the youngest group, the proportion with no training is higher than in any other group except those over 50; among State employees it exceeds all others. Lack of public health training among young workers is most pronounced in State and city departments; only in county units is the proportion of nurses with at least one year of training greater in the youngest age group than the average for all ages.

TABLE 8.—*Public health training reported by public health nurses, according to age group and employing jurisdiction*

Age	State					County					City				
	Total	Training reported				Total	Training reported				Total	Training reported			
		None	Special courses	Less than 1 year	1 year or more		None	Special courses	Less than 1 year	1 year or more		None	Special courses	Less than 1 year	1 year or more
	Number														
Total, all ages	1,186	466	124	307	289	2,846	1,149	167	912	618	3,868	2,406	389	639	434
Under 25	83	54	1	14	14	162	69	12	41	40	88	61	12	13	2
25–29	317	142	29	86	60	711	259	47	257	148	486	293	32	106	55
30–34	244	83	27	76	58	620	240	32	203	145	630	360	57	121	92
35–39	146	46	14	37	49	455	170	26	137	122	593	341	53	123	76
40–44	139	45	14	33	47	373	158	17	119	84	636	394	76	83	83
45–49	107	40	15	31	21	244	110	15	75	44	534	333	69	86	46
50–54	84	27	10	20	27	141	75	14	31	21	380	250	40	49	41
55–59	35	15	9	3	8	66	34	-----	23	9	259	191	25	28	15
60 or over	20	12	2	4	2	33	15	3	13	2	147	111	14	16	6
Unknown	11	2	3	3	3	36	19	1	13	3	115	72	11	14	18
	Percentage														
Total, all ages	100.0	39.3	10.5	25.8	24.4	100.0	40.4	5.9	32.0	21.7	100.0	62.2	10.1	16.5	11.2
Under 25	100.0	65.0	1.2	16.9	16.9	100.0	42.6	7.4	25.3	24.7	100.0	69.3	13.6	14.8	2.3
25–29	100.0	44.8	9.2	27.1	18.9	100.0	36.4	6.6	36.2	20.8	100.0	60.3	6.6	21.8	11.3
30–34	100.0	34.0	11.1	31.1	23.8	100.0	38.7	5.2	32.7	23.4	100.0	57.1	9.1	19.2	14.6
35–39	100.0	31.5	9.6	25.3	33.6	100.0	37.4	5.7	30.1	26.8	100.0	57.5	8.9	20.8	12.8
40–44	100.0	32.4	10.1	23.7	33.8	100.0	41.8	4.5	31.5	22.2	100.0	61.9	11.9	13.1	13.1
45–49	100.0	37.4	14.0	29.0	19.6	100.0	45.1	6.2	30.7	18.0	100.0	62.4	12.9	16.1	8.6
50–54	100.0	32.1	12.0	23.8	32.1	100.0	53.2	9.9	22.0	14.9	100.0	65.8	10.5	12.9	10.8
55–59	100.0	42.9	25.7	8.6	22.8	100.0	51.5	-----	34.9	13.6	100.0	73.7	9.7	10.8	5.8
60 or over	100.0	60.0	10.0	20.0	10.0	100.0	45.4	9.1	39.4	6.1	100.0	75.5	9.5	10.9	4.1
Unknown	100.0	18.1	27.3	27.3	27.3	100.0	52.8	2.8	36.1	8.3	100.0	62.6	9.6	12.2	15.6

EMPLOYMENT EXPERIENCE

Recognizing that experience as well as training is needed to make an efficient employee, the questionnaires in the present survey requested data on the employment history of individuals canvassed. Items included in the questionnaire were: Title of each position held, name and address of each employing organization, type of organization, length of employment in each position, and whether it was full- or part-time.

Failure to obtain exact dates of employment and periods of unemployment has, however, seriously handicapped analysis of the resulting data. In the case of nurses, the situation is rather more difficult than in the case of physicians, since a smaller percentage reported what seemed to be complete employment histories. In the preceding paper in this series [8] it was stated that schedules were classified as adequate or inadequate in reporting employment history according to the number of years of employment reported in relation to the number of years of availability for employment after completing professional training. Nurses were assumed to be employable at 21 years of age if they had 2 years of nursing training; at 22, if they had 3 years or more. Those with college degrees were arbitrarily assumed to be ready for employment at 25 years of age. If less than a full course was reported, an appropriate interpolation was made. In addition, employment histories were called "inadequate" only if the discrepancy in reporting amounted to at least 5 years. Even by these criteria, believed to be fair in the majority of cases, approximately one-third of the nurses failed to report employment sufficient to cover the "employable" period in their individual cases.

It should not be assumed, however, that the data are entirely deficient for all of the more than 2,500 nurses whose employment histories fail to cover the period following their school work. A sampling (approximately 30 percent) of incomplete schedules returned to the field for more adequate information indicated that in a few cases the gaps in the information were due to failure to report short periods of unemployment. For the longer periods the explanation usually was that nurses had been out of public health nursing for a number of years rearing a family. It follows then that, despite the apparent inadequacy of employment reporting by nurses, their reported experience history represents on the whole their complete employment outside of the home.

Private duty and other prior experience.—The experience of public health nurses in other than public health work is summarized in table 9. Almost three-fifths of the group have had prior experience in

[8] See footnote 2.

private duty nursing. Among jurisdictions the percentage is lowest for State nurses and highest for city nurses. A fourth of the total have been hospital supervisors or superintendents, and about the same proportion have had general hospital duty. These categories are not mutually exclusive; private duty commonly occurs in combination with other types of experience. It is interesting to note that relatively few nurses have been instructors of nursing but some have been public school teachers, or have done stenographic or other office work. However, aside from their public health work, the nurses now in health departments have had experience chiefly in private duty nursing and in hospitals.

TABLE 9.—*Types of prior experience reported by nurses*

Type of experience reported	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,846	3,868
No other experience reported	748	39	709	105	223	420
Private duty [1]	4,551	461	4,090	594	1,529	2,428
Hospital supervisor or superintendent	2,016	285	1,731	333	772	911
General hospital duty	1,912	129	1,783	271	713	928
Instructor of nursing	145	44	101	52	53	40
Educator, teacher	250	40	210	51	134	65
Welfare worker	123	16	107	30	31	62
Stenographer, office worker	235	24	211	38	90	107
Emergency nursing work	198	16	182	46	134	18
Other	934	145	789	182	412	340
	Percentage					
Total	100.0	100.0	100.0	100.0	100.0	100.0
No other experience reported	9.5	4.7	10.0	8.9	7.8	10.9
Private duty [1]	57.6	55.3	57.9	50.1	53.7	62.8
Hospital supervisor or superintendent	25.5	34.2	24.5	28.1	27.1	23.6
General hospital duty	24.2	15.5	25.2	22.8	25.1	24.0
Instructor of nursing	1.8	5.3	1.4	4.4	1.9	1.0
Educator, teacher	3.2	4.8	3.0	4.3	4.7	1.7
Welfare worker	1.6	1.9	1.5	2.5	1.1	1.6
Stenographer, office worker	3.0	2.9	3.0	3.2	3.2	2.8
Emergency nursing work	2.5	1.9	2.6	3.9	4.7	.5
Other	11.8	17.4	11.2	15.3	14.5	8.8

[1] Private duty occurs in combination with the majority of other types of experience.

Since most of the reported experience of the nurses outside the field of public health has been in nursing, there is presented in table 10 the length of such experience. The years spent in private duty nursing in hospitals and in homes and staff duty in hospitals are included in the total length of nursing experience. There is little difference between jurisdictional and administrative groups in the amount of nursing experience. Each has had on the average about 5 years of nursing work. More nurses in cities report private duty nursing experience than those from other jurisdictions.

TABLE 10.—*Years of private duty nursing reported by public health nurses*

Years of private duty nursing	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,846	3,868
No such experience	888	170	718	196	434	258
No report on private duty [1]	1,045	65	980	144	306	595
Reported private duty	5,967	598	5,369	846	2,106	3,015
0-4	3,845	367	3,478	544	1,414	1,887
5-9	1,564	182	1,382	202	537	825
10-14	416	38	378	75	117	224
15-19	112	8	104	16	31	65
20 or over	30	3	27	9	7	14
Average	4.9	5.0	4.9	5.1	4.6	5.0
	Percentage					
Total	100.0	100.0	100.0	100.0	100.0	100.0
No such experience	11.2	20.4	10.2	16.5	15.2	6.7
No report on private duty [1]	13.2	7.8	13.9	12.1	10.8	15.4
Reported private duty	75.6	71.8	75.9	71.4	74.0	77.9
0-4	48.7	44.0	49.1	45.9	49.7	48.7
5-9	19.8	21.8	19.6	17.1	18.9	21.3
10-14	5.3	4.6	5.3	6.3	4.1	5.8
15-19	1.4	1.0	1.5	1.3	1.1	1.7
20 or over	.4	.4	.4	.8	.2	.4

[1] Includes nurses who (*a*) did not report all experience, (*b*) reported only the present position; or (*c*) submitted schedules obviously deficient, contradictory, or lacking in detail, e. g., number of years unknown.

Public health experience.—Ten percent of public health nurses report no other work than their present position and an additional 6.5 percent report that all of their employment has been in public health. However, even though more than four-fifths of all currently employed public health nurses have had employment in other fields, it is shown in table 11 that the average length of public health employment for all nurses is 9 years. City nurses exceed this by about 2.5 years; county and State nurses average 2 to 2.5 years less. In spite of the relatively long average experience in the field, over half of the State and county nurses and two-fifths of the whole group have served less than 5 years in public health. Five percent of city nurses have been in the field 25 years or more. The staff average of 8.6 years compares favorably with that found in 1934 by the National Organization for Public Health Nursing. At that time the average total experience in public health among 404 nurses in official departments studied was 6.6 years.[9]

[9] Comparisons are not possible with the White House Conference data in view of the fact that 22.6 percent of the nurses reporting failed to specify the length of their employment.

TABLE 11.—*Length of employment*[1] *in public health among public health nurses*

Years of public health employment reported	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,846	3,868
Under 5	3,249	160	3,089	659	1,555	1,035
5–9	1,497	158	1,339	219	577	701
10–14	1,508	188	1,320	153	419	936
15–19	968	160	808	105	232	631
20–24	458	111	347	38	50	370
25–29	187	44	143	8	12	167
30 or over	33	12	21	4	1	28
Average	9.1	13.0	8.6	7.0	6.7	11.5
	Percentage					
Total	100.0	100.0	100.0	100.0	100.0	100.0
Under 5	41.1	19.2	43.7	55.6	54.6	26.8
5–9	18.9	19.0	19.0	18.5	20.3	18.1
10–14	19.1	22.6	18.7	12.9	14.7	24.2
15–19	12.3	19.2	11.4	8.8	8.2	16.3
20–24	5.8	13.3	4.9	3.2	1.8	9.6
25–29	2.4	5.3	2.0	.7	.4	4.3
30 or over	.4	1.4	.3	.3	(2)	.7

[1] Includes those who reported no other employment than the present position.
[2] Less than 0.1 percent.

Variety of experience.—In judging the extent to which an employee's prior experience fits him for his present duties, one must take into account not only the length but also the character of such experience. Although it may be argued that an employee who has moved about from place to place or has held many different jobs is often an unsatisfactory type of worker, it is also true that breadth of experience leads to professional advancement for the individual and improves the service rendered to the public.

The nurses' schedules furnish 3 indexes of variety of experience. (*a*) Number of public health positions held, (*b*) experience in other States, and (*c*) experience in other agencies, especially voluntary health agencies. Table 12 shows the first of these indexes. Although over half of all nurses in public health departments have had no variety in experience in that they report only one position in the field, the average for the group is 2 positions. Supervisors have had a slightly more varied experience with an average of 3 positions each. Only one out of six of the supervisors is now in her first public health job, which indicates the tendency to require staff experience before a nurse may become a supervisor. A few nurses have had as many as 6 positions in public health, but the proportion of the total is only 3 percent.

TABLE 12.—*Periods of public health employment reported by public health nurses*

Number of periods of public health employment reported	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,846	3,868
1 [1]	4,205	144	4,061	538	1,255	2,412
2	1,889	244	1,645	274	723	892
3	868	167	701	147	379	342
4	470	114	356	91	258	121
5	236	87	149	63	114	59
6	107	35	72	33	55	19
7	68	20	48	22	32	14
8	30	9	21	8	16	6
9 or more	27	13	14	10	14	3
Average	1.9	3.1	1.8	2.3	2.2	1.6
	Percentage					
Total	100.0	100.0	100.0	100.0	100.0	100.0
1 [1]	53.2	17.3	57.5	45.4	44.1	62.3
2	23.9	29.3	23.3	23.1	25.4	23.1
3	11.0	20.0	9.9	12.4	13.3	8.8
4	5.9	13.7	5.0	7.7	9.1	3.1
5	3.0	10.4	2.1	5.3	4.0	1.5
6	1.4	4.2	1.0	2.8	1.9	.5
7	.9	2.4	.7	1.8	1.1	.4
8	.4	1.1	.3	.7	.6	.2
9 or more	.3	1.0	.2	.8	.5	.1

[1] Includes those reporting only present employment.

Not only, as has been shown, are city nurses' individual and average years of service longer than those of State and county nurses (perhaps owing to recent expansion in which State and county nurses have been employed in large numbers), but city nurses more than those in other jurisdictions tend to stay in the same jobs. They are, therefore, much more limited in their variety of experience than are the State and county nurses.

A somewhat better indication of the sort of varied experience most likely to be valuable as training is the number of States in which an individual has worked. This is admittedly subject to the limitation that in individual instances moving from State to State may indicate inefficiency. If, however, the broadened outlook to be gained from working in different States under different administrators be an advantage, more State and county than city nurses have had that advantage. Although the proportion of the total who have worked in more than one State is only 12 percent, 21 percent of State nurses, 18 percent of county nurses, but only 6 percent of city nurses have worked in a State other than the one where they are now employed. Ten percent of the supervisors and 9 percent of State employees have served in 3 or more States.

The third index of variety of experience is employment in agencies such as voluntary health organizations, the Army or Navy, and the United States Public Health Service. Although only 26 percent of public health nurses have had any of these types of experience, the proportion is much larger for supervisors than for their staffs (42 as opposed to 24 percent). Eighty-five percent of all service in agencies other than health departments was in voluntary health agencies. Such service was reported much more frequently by State and county employees than by city nurses Over one-third of all supervisory nurses and one-fourth of State and county nurses have served in voluntary agencies. These data bear out the generally recognized fact that many of the present public health nurses began their work and gained their first experience in nonofficial public health nursing organizations which have accepted the responsibility of giving nurses carefully supervised field experience.

Stability of public health employment.—Stability of employment or job security is the concern not only of the individual but of the service for which he works. Since occupational stability is an important factor influencing choice of vocation among young workers, it becomes important to know what chance for security exists in public health nursing. It is uneconomical to train workers who cannot remain in the service for a reasonable period of time; and a high personnel turnover produces poor service. Data from these schedules do not provide a direct answer to the question of stability, although they do present considerable evidence with bearing on it.

One evidence of stability of employment is the length of experience in a given position. In the case of nurses, over half of whom have had only one position in public health, our best evidence on this point is length of service in the present jurisdiction. This is, admittedly, subject to the limitation that the service has not yet terminated. Among all public health nurses the average length of service in the present position is 7.5 years. Supervisory nurses average about 2 years more; city nurses, 3 years more. The shortest average tenure (4.6 years) occurs among county nurses.

These figures indicate a relatively high stability, in spite of the fact that more than three-quarters of State and county nurses have served less than 5 years. More than two-thirds of city nurses, on the other hand, have served from 5 to 30 years and almost two-fifths of them have been in the same positions from 10 to 20 years. In this connection there is an interesting side light on stability among city employees. The distribution of the number of years of employment in the present position is irregular in that the proportion employed for 10 to 14 years is greater than that for 5 to 9 years. Since rela-

tively few have had more than one position, the length of employment becomes an index of employing policy. Very few of the present staff of nurses were employed between 1929 and 1933, but then an upswing began and continued to 1937. It must be remembered, however, that, considered relatively or absolutely, the recent increase in employment in nursing service in cities did not approach that of States or counties.

TABLE 13.—*Continuity of service in public health among currently employed public health nurses*

Number of periods of nonpublic health employment reported, after the first public health position	All nurses	Supervisory nurses	Staff nurses	State nurses	County nurses	City nurses
	Number					
Total	7,900	833	7,067	1,186	2,846	3,868
None	6,734	654	6,080	965	2,414	3,355
Present position only reported	748	39	709	105	223	420
1	682	121	561	128	246	308
2	287	31	256	46	108	133
3	124	19	105	30	47	47
4	40	4	36	10	20	10
5 or more	33	4	29	7	11	15
Average number of positions out of the field, among those with interrupted service	1.7	1.5	1.7	1.7	1.7	1.6
	Percentage					
Total	100.0	100.0	100.0	100.0	100.0	100.0
None	85.3	78.5	86.0	81.4	84.8	86.7
Present position only reported	9.5	4.7	10.0	8.9	7.8	10.9
1	8.6	14.5	8.0	10.8	8.6	8.0
2	3.6	3.7	3.6	3.9	3.8	3.4
3	1.6	2.3	1.5	2.5	1.7	1.2
4	.5	.5	.5	.8	.7	.3
5 or more	.4	.5	.4	.6	.4	.4

Employment stability, however, is not dependent upon remaining in the same job if the worker remains in the field. A rough index of such stability is shown in a tabulation of the number of periods of full-time employment out of the field after the individual first entered it. This is, however, subject to the limitation that we have no data on those who came into the field at the same time but subsequently left. The available data are presented in table 13.

The conclusion as to stability to be drawn from the table is similar to that previously mentioned, inasmuch as only 15 percent of nurses now in public health have left the field (i. e., have had one or more periods of other employment) after entering it. This makes the assumption that those who reported only the present position have actually had no prior position. Judging by this index of stability,

there is little difference between the administrative and jurisdictional classes, although slightly higher percentages of supervisory nurses and State workers than of the other groups have had interrupted service in the field.

The tendency for public health employees to remain in their jobs without interruption is somewhat greater among nurses than among physicians. Moreover, occupational stability for nurses is even better than it appears in that a number of the "interruptions" to public health employment were occasioned by marriage and the subsequent rearing of a family. In such circumstances, other employment, in the usual sense, was not the reason for leaving the field, although our data reoresent any such period as a discontinuance.

SUMMARY AND DISCUSSION

1. Nurses are the largest professional group in public health and make up almost half of all full-time employees in health departments.

2. The present study, limited to employees in whole-time departments, covers more than one-third of the public health nursing profession and includes practically all public health nurses in official agencies.

3. Although there has been an increase in the basic educational attainment of nurses in the past 10 years, there is still wide variation. About one-fourth of the nurses in public health departments have less than high school graduation in addition to their nursing training; the same proportion have some college work and 9 percent have a college degree. A relatively small proportion of nurses report professional education other than 3 years of nursing training. Staff nurses now are better trained than in 1930, but their academic training level (particularly in cities) is still not up to the standard recommended by the Conference of State and Territorial Health Officers.

4. Half the nurses in public health departments have some public health training but only one in six has as much as a year. Although the Social Security Act has apparently operated to supplement the training of many State and county nurses in service, health departments employ considerable numbers of young nurses, untrained in public health and with little or no experience in either general nursing or public health work. The youngest nurses have less public health training than those of any other age group under 50.

5. City health departments, employing about half the nurses in official agencies, apparently recruit their staffs from the general nursing field. There is a marked tendency for city employees to remain in their jobs longer than those in other types of jurisdictions.

6. There is a marked tendency in public health nursing for positions of administrative responsibility to be held by older workers. This tendency is much more pronounced than among physicians.

7. The majority of nurses in official agencies have had only a single period of employment in public health; but a high degree of occupational stability is evident from the fact that relatively few nurses have had other employment after entering public health, although they did not enter the field immediately after graduation.

8. Apparently a qualification for supervisorship in nursing is prior employment by a voluntary health agency. Three-eighths of all supervisors have served in nonofficial agencies; only one-fifth of staff nurses have done so.

NOTE ON THE "MOST PROBABLE NUMBER" INDEX AS USED IN BACTERIOLOGY

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The statistical analysis of the most probable number index by Halvorson and Ziegler *(1, 2, 3)* indicates the need for a revaluation of its significance in bacteriology. This is particularly true when three bacterial dilutions are used. In such cases, the above authors have shown that the errors of the most probable number index are not functions of the bacterial density, as is true with single dilutions, but of the number of tubes used.

The reason for the use of the mode or "most probable number" in a frequency distribution is that it represents the result of most probable occurrence. Its merit in the field of quantitative bacteriology probably arises from the mathematical ease of calculation. It must be stressed, however, that the most probable number by itself gives no measure of the form of the frequency distribution, even in conjunction with a suitable parameter. In two series of samples, each of three dilutions, one series of 10 tubes and the other of 5 tubes, each may have the same "most probable number" (mode), but the deviation which includes 97 percent of the data in the first case (10 tubes) may be too high by 130 percent and too low by 60 percent, while in the second (5 tubes) the excess and deficiency may amount to 260 and 70 percent, respectively. Thus, the last series of samples has little significance and should probably be discarded. This does not necessarily follow from the fact that it does not fulfill the laws of chance, but simply because it is not sufficiently definite. The sub-

ject of this note is concerned with the calculation of most probable numbers for three dilutions of N–tubes and the associated errors involved.

CALCULATION OF "MOST PROBABLE NUMBER" SIMPLIFIED

Using Hoskins' notation (*4*), the Greenwood-Yule (*5*) equation for the "most probable number" of bacteria per cc., λ, in samples of three dilutions of 10 cc., 1 cc., and 0.1 cc., respectively, is

$$10q+s+0.1u=\frac{10p}{e^{10\lambda}-1}+\frac{r}{e^{\lambda}-1}+\frac{0.1t}{e^{0.1\lambda}-1} \tag{1}$$

where p, r, and t are the number of positive tubes and q, s, and u are the corresponding number of negative tubes. The solution of this equation is generally obtained by methods of approximation based on tables of the function $(1-e^{-ax})$. In order to simplify the solution of equation 1, the nomogram shown herewith has been prepared.[1] This nomogram gives a fairly accurate estimate of the most probable number which may be considered as a first approximation to a more exact estimate obtained by substitution in the equation.

Halvorson and Ziegler (*3*) have plotted the percentage deviation above and below the mode that includes 97 percent of the data (equivalent to twice the standard deviation) obtained with N–tubes in each of three dilutions. The curves were determined empirically and indicate, as may be seen by reference to table 1, that little significance can be attached to the most probable number when the number of tubes used is less than 20 in each dilution. No data were presented by Halvorson and Ziegler for unequal numbers of tubes in each dilution.

More recently, Haldane (*6*) has reexamined the most probable number concept and applied it to epidemiological investigations. In the course of the development of the generalized formula, he has also given a measure of the standard deviation of the most probable number. The derivation of the standard deviation as given by Haldane utilizes the "information available" first introduced by

[1] The nomogram is based on the following approximate equation:

$$\sqrt{\lambda}=\frac{-1.3p+\sqrt{1.8p^2+4N(p+r+t)}}{2N}$$

$$N=10q+s+0.1u$$

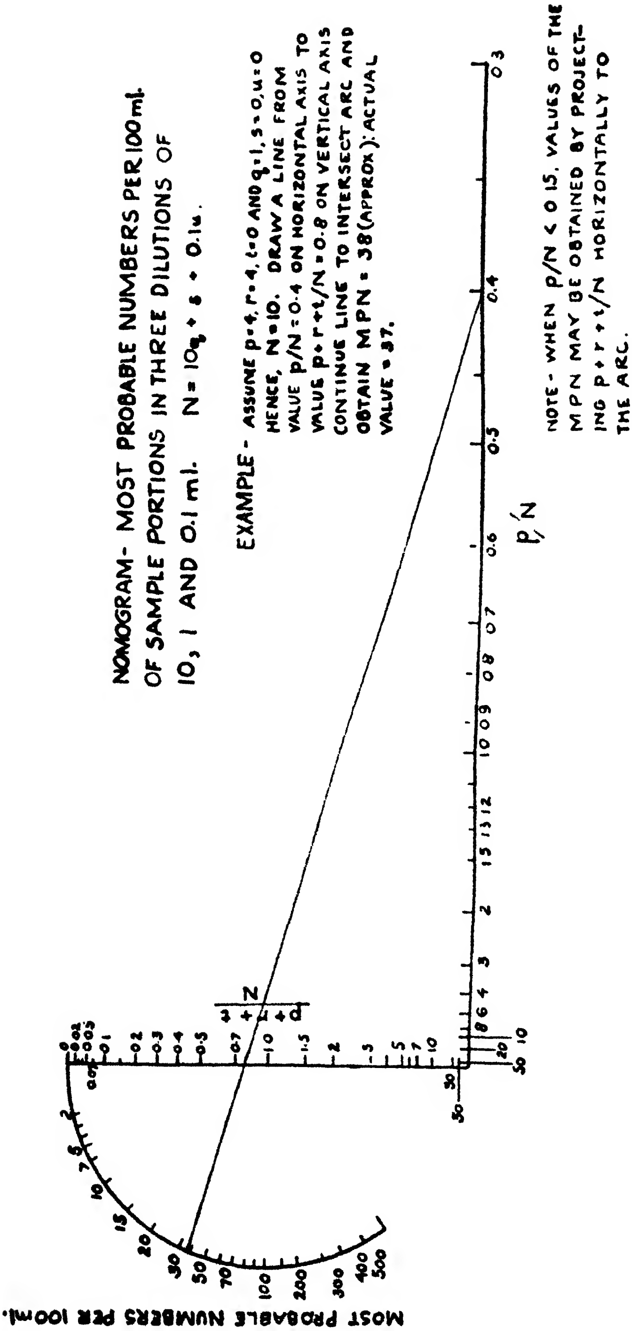
NOMOGRAM- MOST PROBABLE NUMBERS PER 100 ml. OF SAMPLE PORTIONS IN THREE DILUTIONS OF 10, 1 AND 0.1 ml. N = 10q + s + 0.1u.
EXAMPLE - ASSUME p=4, r=4, t=0 AND q=1, s=0, u=0 HENCE, N=10. DRAW A LINE FROM VALUE p/N = 0.4 ON HORIZONTAL AXIS TO VALUE p+r+t/N = 0.8 ON VERTICAL AXIS CONTINUE LINE TO INTERSECT ARC AND OBTAIN MPN = 38(APPROX); ACTUAL VALUE = 37.
NOTE - WHEN p/N < 0.15, VALUES OF THE MPN MAY BE OBTAINED BY PROJECTING p+r+t/N HORIZONTALLY TO THE ARC.
p/N
(p+r+t)/N
MOST PROBABLE NUMBERS PER 100ml.

TABLE 1.—*Deviations from the mode that include 97 percent of the data obtained with N-tubes in each of 3 dilutions in the ratio 10:1:0.1*[1]

Number of tubes in each dilution	Percentage deviation above mode	Percentage deviation below mode	Average deviation $\pm 2\sigma$
5	260	70	----
10	130	60	----
15	90	51	----
20	75	47	61.0
25	64	44	54.0
30	58	42	50.0
40	48	40	44.0
50	43	38	40.5
100	31	30	30.5
150	21	22	21.5

[1] Extrapolated from curves calculated by Halvorson and Ziegler.

Fisher (7). For the case of three dilutions, 10:1:0.1, the information available is given by

$$I=\frac{100pe^{10\lambda}}{(e^{10\lambda}-1)^2}+\frac{re^{\lambda}}{(e^{\lambda}-1)^2}+\frac{0.01te^{0.1\lambda}}{(e^{0.1\lambda}-1)^2} \tag{2}$$

and the standard deviation σ, following Fisher, is obtained from the equation

$$\sigma=\frac{1}{\sqrt{I}} \tag{3}$$

Hence, the standard deviation as obtained by this procedure depends on the number of positive tubes in each dilution. As an example, let us take 40 tubes in each dilution and let the distribution of positive tubes obtained be $p=40$, $r=38$, and $t=9$, giving a most probable number of 3.0. Using equations 2 and 3, we obtain a value of $\sigma=\pm 0.58$. Halvorson and Ziegler give a value of $2\sigma=\pm 1.2$ (assuming deviations given in table 1, above and below the mode, to be approximately the same). These values compare favorably and indicate that for the number of tubes used the standard deviation is sufficiently accurate when expressed only as a function of the number of tubes.

When 20 tubes in each dilution are employed, the distribution tends to be more skewed. Thus, if $p=20$, $r=18$, $t=8$, the most probable number is 3.0 as before. The value of σ obtained from equations 2 and 3 is, however, in this case equal to ± 0.72, whereas Halvorson and Ziegler give $2\sigma=\pm 1.8$ (approximately).

As a final example, let there be five tubes in each dilution, and further let the positive tubes be thus distributed: $p=5$, $r=1$, and $t=1$, giving a most probable number of 0.46. Using equations 2 and 3, $\sigma=\pm 0.26$, which is more than half the most probable number itself. No reasonably accurate estimate can be obtained from the data of Halvorson and Ziegler, as may be seen from table 1. The frequency curve is extremely skewed. More reliance must be placed on the

results of the latter investigators since their data actually represent a test of the validity of equations 2 and 3. However, the same equations themselves indicate that less reliance can be placed upon the most probable number when the number of tubes employed is less than 10 for each dilution.

DISCUSSION

Since the accuracy of the "most probable number" for three different dilutions following Halvorson and Ziegler depends upon the number of tubes used, it is readily seen that, from a statistical standpoint, little reliability can be placed upon the values obtained unless the number of tubes is large (>20). Nor, as Halvorson and Ziegler have shown, is the probability very great that a given combination of positive tubes will occur frequently even when repeated an infinite number of times on the same sample. The fact that the samples examined can be evaluated in terms of a discrete number is valuable as an index, but such most probable numbers cannot all be equally reliable.

What, then, is the value of the most probable number index in bacteriology? Actually, all that can be obtained by use of three dilutions is: (1) An *estimate* of the number of bacteria present in a sample of unknown pollution, a point stressed by Reed (*8*); and (2) the allocation of a discrete value statistically derived regardless of the combinations of positive and negative tubes or "skips" obtained.

It has been pointed out that when the number of tubes used is small, the estimate is at best only approximate. When the number of tubes is large (40 or more in each dilution), the accuracy obtained is about the same as can be obtained with a single dilution. This can be verified by actual computation using Parker's data (*9*) or the data of Halvorson and Ziegler (*1, 3*) for 40 tubes in each dilution. Thus, if the probable number can be roughly estimated, the use of three dilutions adds little to the accuracy of the final result. In fact, if the total number of tubes ordinarily used for making three dilutions were applied to a single dilution, the accuracy of the result in all probability would be increased.

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BIOLOGICAL PRODUCTS

Establishments Licensed for the Propagation and Sale of Viruses, Serums, Toxins, and Analogous Products

There is presented herewith a list of the establishments holding licenses issued by the Federal Security Agency in accordance with the act of Congress approved July 1, 1902, entitled "An act to regulate the sale of viruses, serums, toxins, and analogous products in the District of Columbia, to regulate interstate traffic in said articles, and for other purposes."

The licenses granted to these establishments for the products mentioned do not imply an endorsement of the claims made by the manufacturers for their respective preparations. The granting of a license means that inspection of the establishment concerned and laboratory examinations of samples of its products are made regularly to insure the observance of safe methods of manufacture, to ascertain freedom from contamination, and to determine the potency or safety, or both, of botulinus antitoxin, diphtheria antitoxin, histolyticus antitoxin, odematiens antitoxin, perfringens antitoxin, scarlet fever streptococcus antitoxin, sordellii antitoxin, staphylococcus antitoxin, tetanus antitoxin, vibrion septique antitoxin, antidysenteric serum, antimeningococcic serum, antipneumococcic serum, pneumococcus typing serum, bacterial vaccines made from typhoid bacillus, paratyphoid bacillus A, and paratyphoid bacillus B, diphtheria toxin-antitoxin mixture, diphtheria toxoid, tetanus toxoid, diphtheria toxin for Schick test, scarlet fever streptococcus toxin for Dick test, scarlet fever streptococcus toxin for immunization, and the arsphenamines, the only products for which potency standards or tests have been established.

The enumeration of the products is as follows: Serums are placed first, the antitoxins, being more important, heading the list. The other products are arranged generally in the order of their origin.

Establishments Licensed and Products for Which Licenses Have Been Issued

AMERICAN ESTABLISHMENTS

Parke, Davis & Co., Detroit, Mich.—License No. 1:

Diphtheria antitoxin; erysipelas streptococcus antitoxin; gonococcus antitoxin; meningococcus antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; staphylococcus antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antidysenteric serum; antigonococcic serum; antiinfluenza bacillus serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; hemostatic serum (Lapenta); immune globulin (human), normal horse serum; thyroidectomized horse serum; pneumococcus typing serum; smallpox vaccine; rabies vaccine (Cumming); tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, acne diplococcus, Brucella melitensis, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, prodigiosus bacillus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus and typhoid bacillus, diphtheria toxin-antitoxin mixture; diphtheria toxoid-antitoxin mixture, diphtheria toxoid; staphylococcus toxoid, tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; animal epidermal extracts; animal food extracts; vegetable food extracts; poison ivy extract; pollen extracts; modified bacterial derivatives made from colon bacillus, gonococcus, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from colon bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, and streptococcus.

Mulford Biological Laboratories, Sharp & Dohme, Broad and Wallace Streets, Philadelphia, Pa.—License No. 2:

Botulinus antitoxin; diphtheria antitoxin; erysipelas streptococcus antitoxin; B. histolyticus antitoxin; B. oedematiens antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; B. sordellii antitoxin; staphylococcus antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antidysenteric serum; antierysipeloid serum; antigonococcic serum; antiinfluenza bacillus serum, antimelitensis serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; antitularemic serum, antivenin (Nearctic crotalidae); antivenin Bothropic; antivenin (Crotalus terrificus); antivenin (Latrodectus mactans); acute anterior poliomyelitis immune serum (human); normal human plasma; measles immune serum (human); scarlet fever immune serum (human); normal human serum; immune globulin (human); normal horse serum; pneumococcus typing serum; smallpox vaccine; rabies vaccine (Pasteur); rabies vaccine (killed virus); tuberculin old; tuberculin T R.; tuberculin B. E.; tuberculin B. F.; tuberculin-purified protein derivative; bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, Brucella melitensis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, Bacterium tularense, and typhoid bacillus; sensitized bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; staphylococcus toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; animal epidermal extracts; animal food extracts; vegetable food extracts; poison ivy extract; poison oak extract; miscellaneous allergenic extracts; pneumococcus antibody solution; bacterial antigens made from acne bacillus, colon bacillus, dysentery bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, proteus bacillus, pyocyaneus bacillus, staphylococcus aureus, streptococcus, typhoid bacillus, bee venom; snake venom solution.

The Cutter Laboratory, Berkeley, Calif.—License No. 8:

Diphtheria antitoxin; B. oedematiens antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; B. sordellii antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antimeningococcic serum; antistreptococcic serum; normal horse serum; smallpox vaccine; rabies vaccine (killed virus); tuberculin old; tuberculin B. F.; bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus; staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from colon bacillus, staphylococcus aureus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; tetanus toxoid; diphtheria toxin for Schick test; pollen extracts; poison ivy extract; poison oak extract.

Bureau of Laboratories, Department of Health, Foot East Sixteenth Street, New York City.—License No. 14:

Smallpox vaccine.

Lederle Laboratories, Inc., Pearl River, N. Y.—License No. 17:

Botulinus antitoxin; diphtheria antitoxin; erysipelas streptococcus antitoxin; B. histolyticus antitoxin; B. oedematiens antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; staphylococcus antitoxin; B. sordellii antitoxin; tetanus antitoxin; vibrion septique antitoxin; antianthrax serum; antidysenteric serum; antimeningococcic serum; antipneumococcic serum; encephalitis vaccine, herpes "F" strain; immune globulin (human); normal horse serum; pneumococcus typing serum; smallpox vaccine; rabies vaccine (killed virus); equine encephalomyelitis vaccine; tuberculin old; bacterial vaccines made from acne bacillus, Brucella melitensis, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus; bacterial antigen made from pertussis bacillus; diphtheria toxoid; tetanus toxoid; staphylococcus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; poison ivy extract; poison oak extract; animal epidermal extracts; animal food extracts; vegetable food extracts; animal oil extracts; vegetable oil extracts; fungus extracts; miscellaneous allergenic extracts; snake venom solution.

G. H. Sherman, M. D., Inc., 14600 East Jefferson Avenue, Detroit, Mich.—License No. 30:

Bacterial vaccines made from acne bacillus, Brucella melitensis, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; pollen extracts; bacterial antigens made from colon bacillus, gonococcus, micrococcus catarrhalis, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, and streptococcus.

The Abbott Laboratories, Fourteenth Street and C.-W. Interurban Railroad Tracks, North Chicago, Ill.—License No. 43:

Bacterial vaccines made from acne bacillus, Brucella melitensis, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, micrococcus tetragenus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus, bacterial antigens made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, micrococcus catarrhalis, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus; tetanus toxoid; poison ivy extract; pollen extracts; animal epidermal extracts; animal food extracts; vegetable food extracts; fungus extracts; miscellaneous allergenic extracts.

The Upjohn Co., Kalamazoo, Mich.—License No. 51:

Bacterial vaccines made from colon bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus, bacterial antigens made from colon bacillus, staphylococcus aureus, streptococcus.

E. R. Squibb & Sons' Research and Biological Laboratories, New Brunswick, N. J.—License No. 52:

Diphtheria antitoxin, erysipelas streptococcus antitoxin, perfringens antitoxin, scarlet fever streptococcus antitoxin, staphylococcus antitoxin, tetanus antitoxin; vibrion septique antitoxin; antiinfluenza bacillus serum; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; immune globulin (human); normal horse serum; antivenin (Latrodectus mactans); pneumococcus typing serum; smallpox vaccine; rabies vaccine (Pasteur); rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus; bacterial antigen made from staphylococcus aureus; leucocyte extract; diphtheria toxin-antitoxin mixture; diphtheria toxoid; staphylococcus toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; poison ivy extract; poison oak extract; arsphenamine, neoarsphenamine, sulfarsphenamine.

Eli Lilly & Co., Indianapolis, Ind.—License No. 56:

Diphtheria antitoxin; erysipelas streptococcus antitoxin; perfringens antitoxin; tetanus antitoxin; vibrion septique antitoxin; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; normal horse serum; hemostatic serum (Lilly); heterophile antibody; smallpox vaccine; rabies vaccine (Harris); tuberculin old; bacterial vaccines made from acne bacillus, cholera vibrio, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, plague bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial vaccine made from partially autolized pneumococci; diphtheria toxin-antitoxin mixture; diphtheria toxoid; tetanus toxoid; diphtheria toxin for Schick test; bacterial antigens made from acne bacillus, colon bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, and streptococcus; fungus antigens; trichinella extract.

Gilliland Laboratories, Marietta, Pa.—License No. 63:

Diphtheria antitoxin; perfringens antitoxin; scarlet fever streptococcus antitoxin; tetanus antitoxin; vibrion septique antitoxin; anticolon bacillus serum; antimeningococcic serum; antipneumococcic

serum; antistreptococcic serum; immune globulin (human); normal horse serum; pneumococcus typing serum; smallpox vaccine; rabies vaccine (Pasteur); rabies vaccine (killed virus); tuberculin old; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid, tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization.

Antitoxin and Vaccine Laboratory, Department of Public Health, Commonwealth of Massachusetts, 375 South Street, Jamaica Plain, Boston 30, Mass.—License No. 64:

Diphtheria antitoxin; scarlet fever streptococcus antitoxin; antiinfluenza bacillus serum; antimeningococcic serum; antipneumococcic serum; pneumococcus typing serum; smallpox vaccine; tuberculin old; bacterial vaccines made from paratyphoid bacillus A, paratyphoid bacillus B, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; diphtheria toxin for Schick test.

United States Standard Products Co., Woodworth, Wis.—License No. 65:

Diphtheria antitoxin; erysipelas streptococcus antitoxin; perfringens antitoxin; tetanus antitoxin; vibrion septique antitoxin; antimeningococcic serum; normal horse serum; smallpox vaccine; rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; bacterial antigens made from staphylococcus albus, staphylococcus aureus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; pollen extracts; poison ivy extract; poison oak extract.

D. L. Harris Laboratories, Metropolitan Building, St. Louis, Mo.—License No. 66:

Rabies vaccine (Harris).

The Arlington Chemical Co., Yonkers, N. Y.—License No 67:

Bacterial vaccines made from colon bacillus, Friedländer bacillus, micrococcus catarrhalis, micrococcus tetragenus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, and streptococcus, fungus extracts; pollen extracts; animal epidermal extracts; animal food extracts, vegetable food extracts; miscellaneous allergenic extracts.

Dermatological Research Laboratories, 1720 Lombard Street, Philadelphia, Pa.—License No. 68:

Arsphenamine; silver arsphenamine; neoarsphenamine, sulfarsphenamine; bismuth arsphenamine sulfonate; neosilver arsphenamine; trisodium sulfarsphenamine.

The Winthrop Chemical Co , Inc., 33 Riverside Avenue, Rensselaer, N. Y.—License No. 69.

Arsphenamine; arsphenamine diglucoside; neoarsphenamine; silver arsphenamine; sulfarsphenamine; acetylglycarsenobenzene.

Diarsenol Co., Inc., 72 Kingsley Street, Buffalo, N. Y.—License No. 70.

Arsphenamine; neoarsphenamine; sodium arsphenamine; sulfarsphenamine.

Mallinckrodt Chemical Works, St. Louis, Mo.—License No. 77:

Arsphenamine; neoarsphenamine; sulfarsphenamine.

Merck & Co., Inc., Rahway, N. J.—License No. 82.

Arsphenamine, neoarsphenamine; sulfarsphenamine.

Terrell Laboratories, Texas National Bank Building, Fort Worth, Tex.—License No. 84:

Rabies vaccine (killed virus).

Jensen-Salsbery Laboratories, Twenty-first and Penn Streets, Kansas City, Mo.—License No. 85:

Botulinus antitoxin; antianthrax serum, antierysipeloid serum; rabies vaccine (killed virus); bacterial vaccine made from Brucella melitensis; diphtheria toxin for Schick test; diphtheria toxoid.

Hollister-Stier Laboratories, Spokane, Wash., and Los Angeles, Calif.—License No. 91:

Acute anterior poliomyelitis immune serum (human); bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and xerosis bacillus; animal epidermal extracts, animal food extracts, fungus extracts, miscellaneous allergenic extracts, poison ivy extract; poison oak extract; pollen extracts; vegetable food extracts.

Medical Arts Laboratory, Medical Arts Building. Oklahoma City, Okla.—License No. 98:

Rabies vaccine (killed virus).

Bureau of Laboratories, Michigan State Department of Health, Lansing, Mich.—License No. 99.

Diphtheria antitoxin; scarlet fever streptococcus antitoxin; tetanus antitoxin; antimeningococcic serum; antipneumococcic serum; pneumococcus typing serum; smallpox vaccine; rabies vaccine (Cumming); tuberculin old; bacterial vaccines made from pertussis bacillus and typhoid bacillus; diphtheria toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization.

National Drug Co., 5109 Germantown Avenue, Philadelphia, Pa.—License No. 101:

Diphtheria antitoxin, erysipelas streptococcus antitoxin, scarlet fever streptococcus antitoxin; perfringens antitoxin; staphylococcus antitoxin; tetanus antitoxin; vibrion septique antitoxin; antimeningococcic serum; antipneumococcic serum; antistreptococcic serum; immune globulin (human);

normal horse serum; pneumococcus typing serum; tuberculin old; smallpox vaccine; rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, Brucella melitensis, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, meningococcus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; diphtheria toxin-antitoxin mixture; diphtheria toxoid; staphylococcus toxoid; tetanus toxoid; diphtheria toxin for Schick test; scarlet fever streptococcus toxin for Dick test; scarlet fever streptococcus toxin for immunization; miscellaneous allergenic extracts; pollen extracts.

Mulford Colloid Laboratories, Thirty-eighth and Ludlow Streets, Philadelphia, Pa.—License No. 102:
Poison ivy extract; poison oak extract.

Allergy Laboratories, 1200 North Walker Street, Oklahoma City, Okla.—License No. 103:
Pollen extracts; vegetable food extracts; animal epidermal extracts; miscellaneous allergenic extracts.

Hixson Laboratories (Inc), Johnstown, Ohio.—License No 104:
Diphtheria antitoxin; tetanus antitoxin; antimeningococcic serum; normal horse serum; rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, pseudodiphtheria bacillus, staphylococcus albus, staphylococcus aureus, streptococcus and typhoid bacillus; diphtheria toxin-antitoxin mixture, diphtheria toxoid; tetanus toxoid; diphtheria toxin for Schick test.

C. F. Kirk Co., New York, N. Y.—License No. 105:
Bacterial vaccines made from acne bacillus, colon bacillus, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus; pollen extracts

Knapp & Knapp, 2921 So. Olive Avenue, Burbank, Calif —License No 106
Pollen extracts.

The Porro Biological Laboratories, 718 Medical Arts Building, Tacoma, Wash.- License No. 107
Bacterial vaccines made from micrococcus catarrhalis, pneumococcus, staphylococcus aureus, and streptococcus, pollen extracts; animal epidermal extracts; vegetable food extracts, miscellaneous allergenic extracts.

Central Pharmacal Co., Seymour, Ind —License No. 109·
Bacterial antigens made from colon bacillus, Friedländer bacillus, gonococcus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus.

Pitman-Moore Co., Division of Allied Laboratories, Inc , Zionsville, Ind —License No. 110:
Diphtheria antitoxin; perfringens antitoxin; tetanus antitoxin; vibrion septique antitoxin, antierysipeloid serum; immune globulin (human); rabies vaccine (killed virus); bacterial vaccines made from acne bacillus, colon bacillus, Brucella melitensis, Friedländer bacillus, gonococcus, influenza bacillus, micrococcus catarrhalis, micrococcus tetragenus, paratyphoid bacillus A, paratyphoid bacillus B, pertussis bacillus, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, and typhoid bacillus, bacterial antigens made from colon bacillus, gonococcus, staphylococcus albus, staphylococcus aureus, streptococcus, diphtheria toxoid, tetanus toxoid; diphtheria toxin for Schick test, pollen extracts.

The Wm. S. Merrell Co., Cincinnati, Ohio.—License No. 111:
Bacterial vaccines made from colon bacillus, Friedländer bacillus, influenza bacillus, micrococcus catarrhalis, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, staphylococcus albus, staphylococcus aureus, streptococcus, typhoid bacillus

Wyatt Clinic Laboratories, Tucson, Ariz.—License No. 112.
Bacterial antigen made from streptococcus.

Michael Reese Hospital, Twenty-ninth Street and Ellis Avenue, Chicago, Ill.—License No. 113·
Acute anterior poliomyelitis immune serum (human); measles immune serum (human); scarlet fever immune serum (human); normal human serum.

The Milwaukee Serum Center, Columbia Hospital, Milwaukee, Wis.—License No. 117:
Acute anterior poliomyelitis immune serum (human); measles immune serum (human); scarlet fever immune serum (human); normal human serum.

Barry Allergy Laboratory, Michigan Theater Building, Detroit, Mich.—License No. 119:
Pollen extracts.

Biological Laboratory, Illinois Department of Health, Springfield, Ill.—License No. 120:
Rabies vaccine (killed virus); bacterial vaccine made from typhoid bacillus; diphtheria toxoid; diphtheria toxin for Schick test.

State Department of Health, Austin, Tex.—License No. 121.
Rabies vaccine (killed virus); bacterial vaccines made from paratyphoid bacillus A, paratyphoid bacillus B, typhoid bacillus; diphtheria toxin for Schick test, diphtheria toxoid.

Turner's Clinical and X-ray Laboratories, El Paso, Tex.—License No. 122:
Rabies vaccine (killed virus).

Manhattan Convalescent Serum Laboratory, Health Research Fund, Inc., Fifteenth Street and East River, New York, N. Y.—License No. 123:

Measles immune serum (human); scarlet fever immune serum (human); normal human serum.

Children's Hospital Convalescent Serum Center, Los Angeles, Calif.—License No. 124:

Measles immune serum (human); acute anterior poliomyelitis immune serum (human); scarlet fever immune serum (human), normal human serum.

Hynson, Westcott and Dunning, Baltimore, Md.—License No. 125:

Snake venom solution.

R. J. Strasenburgh Co., Rochester, N. Y.—License No. 127:

Bee venom ointment.

Research Foundation of Toledo Hospital, Inc., Toledo, Ohio.—License No. 128:

Bacterial antigen made from colon bacillus.

A. W. Kretschmar, Inc., 396 Broadway, New York, N. Y.—License No. 132:

Bee venom solution.

Michigan State College, East Lansing, Mich.—License No. 133:

Bacterial antigen made from Brucella melitensis.

Bio-Therapeutic Laboratories, 22 Halsted Street, East Orange, N. J.—License No. 135:

Bacterial antigens made from pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, and streptococcus.

Hoffmann-La Roche, Inc., Roche Park, Nutley, N. J.—License No. 136:

Bee venom.

Iowa State Department of Health Serum Center, Des Moines, Iowa.—License No. 137:

Normal human serum, measles immune serum (human), pertussis immune serum (human), poliomyelitis immune serum (human), and scarlet fever immune serum (human).

University of Minnesota Human Serum Laboratory, Minneapolis, Minn.—License No. 138:

Normal human serum, measles immune serum (human), pertussis immune serum (human), poliomyelitis immune serum (human), and scarlet fever immune serum (human).

Philadelphia Serum Exchange, The Children's Hospital, Philadelphia, Pa.—License No. 139:

Normal human serum, measles immune serum (human), pertussis immune serum (human), and scarlet fever immune serum (human).

Hyland Laboratories, Los Angeles, Calif.—License No. 140.

Normal human plasma, normal human serum, measles immune serum (human), pertussis immune serum (human), poliomyelitis immune serum (human), and scarlet fever immune serum (human).

The Venomin Co., Venice, Fla.—License No. 141:

Bee venom solution.

The Bayer Co., Inc., Rensselaer, N. Y.—License No. 142:

Acetylglycarsenobenzene, neoarsphenamine, silver arsphenamine, sulfarsphenamine.

The Hicks Laboratory, Tuscon, Ariz.—License No. 143:

Bacterial vaccine made from streptococcus.

Reichel Laboratories, Kimberton, Pa.—License No. 144:

Normal human plasma.

FOREIGN ESTABLISHMENTS

Institut Pasteur de Paris, 36 rue du Dr. Roux, Paris, France.—License No. 11. Selling agents for the United States, Mr. A. Charklian, Pasteur Vaccine Laboratories of France, 516 Fifth Avenue, New York, N. Y.:

Diphtheria antitoxin; tetanus antitoxin; antianthrax serum; antidysenteric serum; antiplague serum; antistreptococcic serum; bacterial vaccines made from cholera vibrio, plague bacillus, staphylococcus albus, and staphylococcus aureus.

Interessen Gesellschaft Farbenindustrie Aktiengesellschaft, Hoechst am Main, Germany.—License No. 24. Selling agents for the United States, The Winthrop Chemical Co., 170 Varick Street, New York, N. Y.:

Tuberculin old; tuberculin T. R.; tuberculin B. E.; tuberculin B. F.; bacterial vaccines made from cholera vibrio, gonococcus, staphylococcus albus, staphylococcus aureus, and staphylococcus citreus; typhoid bacillus; sensitized bacterial vaccine made from typhoid bacillus; fungus extracts; arsphenamine; neoarsphenamine; sodium arsphenamine; silver arsphenamine; neosilver arsphenamine; sulfarsphenamine; sulfoxylarsphenamine.

Connaught Antitoxin Laboratory, University of Toronto, Toronto, Canada.—License No. 73:

Diphtheria antitoxin; staphylococcus antitoxin; tetanus antitoxin; diphtheria toxoid; staphylococcus toxoid.

Laboratoire de Biochimie Medicale, 19-21 rue Van-Loo, Paris, France.—License No. 83. Selling agents for the United States, Anglo-French Drug Co., 1270 Broadway, New York, N. Y.; selling agents for Puerto Rico, Chas. Vere, box 216, San Juan, P. R.:

Sulfarsphenamine.

Instituto Sieroterapico Milanese, Via Darwin 20, Milan, Italy.—License No. 87. Selling agents for the United States, Italian Drugs Importing Co., 225 Lafayette Street, New York, N Y.; selling agent for Puerto Rico, Mr. Braulio Caballero, San Juan, P. R.:

Antianthrax serum; bacterial vaccines made from colon bacillus, gonococcus, pneumococcus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, and streptococcus; neoarsphenamine; acetyl-gluco-arsphenamine.

Boots Pure Drug Co., Ltd., Nottingham, England.—License No. 92. Selling agents for the United States, The United Drug Co., 43 Leon Street, Boston, Mass.:

Arsphenamine diglucoside.

Sero-Bacteriological Department, Bayer-Meister-Lucius, Behringswerke, I. G. Farbenindustrie, A. G. Section, Marburg-Lahn, Germany.—License No. 97. Selling agents for the United States, The Winthrop Chemical Co., 170 Varick Street, New York, N. Y.:

Diphtheria antitoxin; tetanus antitoxin; antistreptococcic serum; normal horse serum; bacterial vaccines made from colon bacillus, gonococcus, pneumococcus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, and streptococcus.

Laboratoire de Bacteriophage, 75 rue Olivier de Serres, Paris, France.—License No. 108. Selling agents for the United States, Anglo-French Drug Co., 1270 Broadway, New York, N. Y.; selling agents for Puerto Rico, Mr. Joaquin Belendez, San Juan, P. R.:

Bacterial antigens made from colon bacillus, dysentery bacillus, enterococcus, Friedländer bacillus, paradysentery bacillus, paratyphoid bacillus A, paratyphoid bacillus B, pneumococcus, proteus bacillus, pyocyaneus bacillus, staphylococcus albus, staphylococcus aureus, staphylococcus citreus, streptococcus, and typhoid bacillus.

Dr. Kade, Elisabeth Ufer 35, Berlin SO, 36, Germany.—License No. 114:

Bacterial vaccine made from colon bacillus.

La Biotherapie, 5 rue Paul-Barruel, Paris, France.—License No. 115:

Bacterial vaccines made from cholera vibrio, colon bacillus, dysentery bacillus, paratyphoid bacillus A, paratyphoid bacillus B, and typhoid bacillus; bacterial antigens made from pneumococcus, staphylococcus albus, staphylococcus aureus, and streptococcus.

Laboratorio Brasileiro de Chimiotherapia, Rua General Roca No. 28, Rio de Janeiro, Brazil.—License No. 116. Selling agents for the United States and Hawaii, Ernst Bischoff Co , Inc., Ivoryton, Conn.; selling agents for Puerto Rico, Cesar A. Toro, Apartado 3854, Santurce, P. R.:

Fungus extracts.

Wellcome Physiological Research Laboratories, Beckenham, Kent, England.—License No. 129:

Russell viper venom.

Schering, A. G., Charlottenburg, 1, Berlin, Germany.—License No. 130.

Bacterial vaccine made from pertussis bacillus.

Heinrich Mack Nachf, Illertissen, nr. Ulm, Germany.—License No. 131:

Bee venom solution.

Ayerst, McKenna, and Harrison, Montreal, Canada.—License No. 134:

Staphylococcus toxoid; bacterial vaccines made from influenza bacillus, micrococcus catarrhalis, pertussis bacillus, pneumococcus, and streptococcus.

REPORT ON MARKET MILK SUPPLIES OF CERTAIN URBAN COMMUNITIES

Compliance of the Market Milk Supplies of Certain Urban Communities With the Grade A Pasteurized and Grade A Raw Milk Requirements of the Public Health Service Milk Ordinance and Code, as Shown by Compliance (Not Safety) Ratings of 90 Percent or More Reported by the State Milk-Sanitation Authorities During the Period January 1, 1939, to December 31, 1940

The accompanying list gives the fifteenth semiannual revision of the list of certain urban communities in which the pasteurized market milk is both produced and pasteurized in accordance with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code and in which the raw market milk sold to the final consumer is produced in accordance with the Grade A raw milk requirements of said ordinance and code, as shown by ratings of 90 percent or more reported by State milk-sanitation authorities.

These ratings are not a complete measure of safety but represent the degree of compliance with the Grade A requirements of the Public Health Service Milk Ordinance and Code. Safety estimates should also take into account the percentage of milk pasteurized, which is given in the following tables.

The primary reason for publishing such lists from time to time is to encourage the communities of the United States to attain and maintain a high level of excellence in the public health control of milk supplies.

It is emphasized that the Public Health Service does not intend to imply that only those communities on the list are provided with high-grade milk supplies. Some communities which have high-grade milk supplies are not included because arrangements have not been made for the determination of their ratings by the State milk-sanitation authority. In other cases the ratings which have been determined are now more than 2 years old and have therefore lapsed. In still other communities with high-grade milk supplies there seems, in the opinion of the community, to be no local necessity nor desire for rating or inclusion in the list, nor any reasonable local benefit to be derived therefrom.

The rules under which a community is included in this list are as follows:

(1) All ratings must have been determined by the State milk-sanitation authority in accordance with the Public Health Service rating method (Pub. Health Rep., **53:** 1386 (1938). Reprint No. 1970), based upon the Grade A pasteurized milk and the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code.

(2) No community will be included in the list unless both its pasteurized milk and its raw milk ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the raw milk ratings are 90 percent or more. Communities which receive, without local inspection, milk from other sheds will be included in the list only if the locally inspected supply, as well as the shipped-in supply, shows a rating of 90 percent or more.

(3) The rating used will be the latest rating submitted to the Public Health Service, but no rating will be used which is more than 2 years old.

(4) The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. If such check rating is less than 90 percent but not less than 85, the city will be removed from the 90 percent list after 6 months unless a resurvey submitted by the State during this probationary interim shows a rating of 90 percent or more. If, however, such check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for a period of 2 years from the date of the check survey unless a subsequent rating submitted during this period warrants its removal.

Communities are urgently advised to bring their ordinances up to date at least every 5 years, since ratings will be made on the basis of later editions if those adopted locally are more than 5 years old.

Communities which are not now on the list and desire to be rated should request the State milk-sanitation authority to determine their ratings and, if necessary, should improve their status sufficiently to merit inclusion in the list.

Communities which are now on the list should not permit their ratings to lapse, as ratings more than 2 years old cannot be used.

Communities which have not adopted the Public Health Service Milk Ordinance may wish to give thoughtful consideration to the advisability of doing so. It is obviously easier to satisfy the requirements upon which the rating method is based if these are included in the local legislation.

Communities which are enforcing the Public Health Service Milk Ordinance, but which have not yet been admitted to the list, should determine whether this has been the result of failure to enforce the ordinance strictly or failure to bring the ordinance up to date.

State milk-sanitation authorities which are not now equipped to determine municipal ratings are urged, in fairness to their communities, to equip themselves as soon as possible. The personnel required is small, as in most States one milk specialist is sufficient for the work.

TABLE 1.—*Communities in which all market milk is pasteurized. In these communities market milk complies with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized milk ratings of 90 percent or more* [1]

Community	Percentage of milk pasteurized	Date of rating	Community	Percentage of milk pasteurized	Date of rating
ILLINOIS			MISSOURI		
Aurora	100	May 3, 1940.			
Brooklyn	100	Mar. 22, 1940.	St. Louis	100	June 7, 1940.
Canteen	100	Do.			
Centerville	100	Do.	NORTH CAROLINA		
East St. Louis	100	Do			
Elgin	100	July 12, 1940.	Clinton	100	June 5, 1940.
Fairmont City	100	Mar 22, 1940.	Fort Bragg	100	June 4, 1940.
National City	100	Do.	Greenville	100	June 15, 1940.
Stites	100	Do.	Sylva	100	May 10, 1940.
MINNESOTA					
Winona	100	Sept. 1940.			

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

The inclusion of a community in this list means that the pasteurized milk sold in the community, if any, is of such a degree of excellence that the weighted average of the percentages of compliance with the various items of sanitation required for Grade A pasteurized milk is 90 percent or more and that, similarly, the raw milk sold in the community, if any, so nearly meets the requirements that the weighted

average of the percentages of compliance with the various items of sanitation required for Grade A raw milk is 90 percent or more. However, high-grade pasteurized milk is safer than high-grade raw milk, because of the added protection of pasteurization. To secure this added protection, those who are dependent on raw milk can pasteurize the milk at home in the following simple manner: Heat the milk over a hot flame to 165° F., stirring constantly; then immediately place the vessel in cold water and continue stirring until cool.

TABLE 2.—*Communities in which some market milk is pasteurized. In these communities the pasteurized market milk complies with the Grade A pasteurized milk requirements and the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized and raw milk ratings, respectively, of 90 percent or more* [1]

[NOTE.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method]

Community	Percentage of milk pasteurized	Date of rating
ALABAMA		
Dothan	39	May 30, 1940.
Montgomery	28	Feb. 24, 1940.
Tuscaloosa	86	May 24, 1940.
ARKANSAS		
El Dorado	39	June 1940.
Fayetteville	60	Nov. 1940.
Fort Smith	48	Sept. 1940.
Jonesboro	59	Oct. 1940.
Little Rock	50	Do
Osceola	42	Jan. 1940.
Pine Bluff	25	June 1940.
Texarkana	47	Sept. 1940.
FLORIDA		
Coral Gables	97	Apr. 1940.
Dania	95	Mar 28, 1940.
Fort Lauderdale	95	Do.
Hollywood	95	Do.
Miami	97	Apr. 1940.
Pompano	95	Mar 28, 1940.
Tallahassee	38	Aug. 1940.
GEORGIA		
Americus	13	June 21, 1939.
Statesboro	40	Mar. 14, 1940.
ILLINOIS		
Chicago	99.9	May 20, 1939.
Decatur	92	Oct. 3, 1940.
Evanston	99.9	Apr. 17, 1940.
Glenco	99.8	Apr. 11, 1940.
Highland Park	99.8	Do.
Kenilworth	99.8	Do.
Lake Bluff	99.8	Do.
Lake Forest	99.8	Do.
Peoria	97	May 23, 1940.
Waukegan	99.9	Apr. 3, 1940.
Winnetka	99.8	Apr. 11, 1940.
KANSAS		
Chanute	40	May 1940.
Lawrence	69	Do.
Wellington	54	Apr. 1940.
Wichita	75	Dec. 1939.
KENTUCKY		
Berea	1	Nov. 1939.
Bowling Green	70	Dec. 22, 1939.
Glasgow	68	June 27, 1939.
Henderson	45	June 11, 1940.
Jefferson County	43	Aug. 1939.
Lexington	66	Sept. 1940.
Louisville	97	Oct. 1939.
Richmond	22	Nov. 1939
Somerset	9	Nov. 1940
MICHIGAN		
Crystal City	41	July 24, 1940.
Iron River	51	Do.
Stambaugh	51	Do
MINNESOTA		
Little Falls	70	June 26, 1939.
MISSISSIPPI		
Greenville	58	May 25, 1939.
Tupelo	21	Jan. 6, 1939.
MISSOURI		
Clayton	([2])	Dec. 14, 1939.
Ferguson	([2])	Do.
Glendale	([2])	Do.
Kirkwood	([2])	Do.
Maplewood	([2])	June 7, 1940.
University City	([2])	Dec. 14, 1939.
Webster Groves	([2])	Do.
NEW MEXICO		
Albuquerque	72	Nov. 30, 1940.
Las Vegas	65	July 25, 1939.
Roswell	77	Aug. 8, 1939.
Santa Fe	44	Dec. 1939.
NORTH CAROLINA		
Asheville	66	June 14, 1940.
Black Mountain	24	May 21, 1940.
Durham	91	Oct. 1940.
Fayetteville	55	June 4, 1940.
Franklin	85	July 19, 1939.
Greensboro	86	Aug. 1940.
Goldsboro	62	June 5, 1940.

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.
[2] The percentage of the total milk supply pasteurized cannot be accurately determined owing to the overlapping of milk routes.

Table 2.—*Communities in which some market milk is pasteurized. In these communities the pasteurized market milk complies with the grade A pasteurized milk requirements and the raw market milk complies with the grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized and raw milk ratings, respectively, of 90 percent or more*—Contd.

Community	Percentage of milk pasteurized	Date of rating
NORTH CAROLINA—con.		
Hendersonville	73	June 26, 1940.
Hope Mills	25	June 4, 1940.
Kinston	12	July 9, 1940.
Lumberton	86	May 29, 1940.
Rockingham	53	Apr. 9, 1940.
Roxboro	86	July 2, 1940.
Tryon	49	July 24, 1939.
Waynesville	60	May 9, 1940.
Weaverville	40	June 5, 1940.
Winston-Salem	78	Nov. 1939.
NORTH DAKOTA		
Valley City	23	Nov. 10, 1939.
OHIO		
Athens	80	July 6, 1940.
OKLAHOMA		
Ada	55	June 27, 1940.
Bartlesville	45	Dec. 19, 1939
Blackwell	35	Nov. 28, 1939.
Lawton	47	Feb. 22, 1939.
Muskogee	82	June 4, 1940.
Oklahoma City	73	Mar. 29, 1939.
Okmulgee	60	July 22, 1940.
Seminole	63	Mar. 26, 1940.
Tulsa	74	Apr. 6, 1940.
Wewoka	52	July 8, 1940.
OREGON		
Astoria	64	June 12, 1940.
Eugene	60	Nov. 1, 1940.
Portland	82	Apr. 3, 1940.
Seaside	67	June 14, 1940.
SOUTH CAROLINA		
Walterboro	26	Dec. 6, 1939.
TENNESSEE		
Bristol	69	July 14, 1939.
Memphis	90	Dec. 1940.
TEXAS		
Abilene	67	Apr. 25, 1939.
Amarillo	78	Aug. 12, 1940.
Ballinger	49	Apr. 21, 1939
Big Spring	53	Aug. 8, 1940.
Brownwood	21	Dec. 19, 1939.
Bryan	14	July 20, 1940.
Canyon	42	Aug. 9, 1940.
Corpus Christi	87	May 26, 1939.
Crystal City	89	June 27, 1940
Dallas	85	Dec. 7, 1940.
Fort Worth	75	Feb. 25, 1939.
Gainesville	63	June 30, 1939.
Jacksonville	85	May 2, 1940
Kerrville	74	Sept. 6, 1939.
Lamesa	38	June 10, 1940.
Lubbock	76	Oct. 28, 1939.
Lufkin	43	Aug. 1, 1940.
Palestine	23	Jan. 30, 1940.
San Angelo	65	May 13, 1940.
San Antonio	82	June 28, 1940.
Seguin	19	Dec. 11, 1940.
Sherman	43	June 17, 1939.
Texarkana	26	Aug. 16, 1939.
Tyler	42	June 12, 1940.
Waco	48	Mar. 30, 1939.
VIRGINIA		
Bristol	69	July 14, 1939.
Lexington	41	Oct. 26, 1939.
Pulaski	77	Sept. 20, 1939.
South Boston	72	Sept. 22, 1939.
Waynesboro	95	Oct. 11, 1939
Williamsburg	41	May 3, 1939.
WASHINGTON		
Camas	8	May 22, 1939.
Vancouver	31	May 25, 1939.
Walla Walla	53	Apr. 14, 1939.
Yakima	67	Apr. 20, 1939.
WEST VIRGINIA		
Huntington	66	June 5, 1939.
WYOMING		
Casper	61	Nov. 15, 1940.
Cheyenne	66	Oct. 20, 1940.

TABLE 3.—*Communities in which no market milk is pasteurized, but in which the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by raw milk ratings of 90 percent or more* [1]

[NOTE.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method]

Community	Date of rating	Community	Date of rating
ALABAMA		NORTH CAROLINA—continued	
Bridgeport	June 29, 1940.	Mars Hill	Feb. 21, 1939.
Demopolis	Oct. 23, 1940.	Mount Olive	June 5, 1940.
Lanett	Mar. 19, 1940.	Murfreesboro	July 17, 1940.
Scottsboro	June 29, 1940.	Parmele	June 20, 1940.
Stevenson	Do.	Raeford	May 20, 1940.
FLORIDA		Red Springs	May 29, 1940.
Apalachicola	Jan. 1940.	Rich Square	July 16, 1940.
		Robersonville	June 20, 1940.
KANSAS		Rosehill	May 23, 1940.
Horton	June 1940.	Scotland Neck	July 16, 1940.
		Wallace	May 23, 1940.
MISSISSIPPI		Warsaw	Do.
Holly Springs	Jan. 4, 1939.	Weldon	July 16, 1940.
		Williamston	June 20, 1940.
MISSOURI		Winton	July 17, 1940.
Brentwood	June 7, 1940.		
		SOUTH CAROLINA	
NORTH CAROLINA		Hartsville	Nov. 9, 1939.
Angier	June 6, 1940.		
Bethel	May 15, 1940.	TEXAS	
Brevard	July 28, 1939.	Colorado	Nov. 3, 1939.
Calypso	May 23, 1940.	Commerce	Mar. 16, 1939.
Coats	June 6, 1940.	Del Rio	June 29, 1940.
Dunn	Do.		
Elkin	Sept. 18, 1939.	VIRGINIA	
Erwin	June 6, 1940.	Blackstone	Nov. 2, 1939.
Faison	May 23, 1940.	Boydton	Apr. 26, 1939.
Farmville	May 15, 1940.		
Jackson	July 16, 1940.	WEST VIRGINIA	
Kenansville	May 23, 1940.		
Lillington	June 6, 1940.	Grantsville	June 7, 1939.

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

CANCER MORTALITY IN THE UNITED STATES

III. Geographic Variation in Recorded Cancer Mortality for Detailed Sites, for an Average of the Years 1930–32 [1]

Public Health Bulletin No. 257 is the third in a series of studies of cancer mortality in the United States, made from unpublished data made available by the Bureau of the Census. It deals with (1) the geographic variation in recorded cancer mortality for detailed sites in separate States; (2) skin cancer related to other cancer mortalities in States; (3) mortality for specific sites of cancer with varying urbanization of the population; (4) cancer mortality, urbanization, and hospital facilities; and (5) mortality from cancer of the uterus and the birth rate in States.

[1] Public Health Bulletin No. 257, same title as above. By Mary Gover. From the Division of Public Health Methods, National Institute of Health and the National Cancer Institute, in cooperation with the Division of Vital Statistics, United States Bureau of the Census. Available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents per copy.

DR. CHARLES VALUE CHAPIN

On January 31, 1941, Dr. Charles Value Chapin, the Superintendent of Health in Providence, R. I., from 1884 to 1932, died after an illness of a few days. Doctor Chapin was the dean of health officers in the United States and probably to him more than to anyone else is due the rational outlook on the common communicable diseases which has had some part in greatly lowering their incidence and severity. In developing this outlook, he opposed deep-seated ideas and practices with their attendant interests. Doctor Chapin took his responsibilities as a health officer intimately, seriously, and personally. He showed more interest in actually benefiting his community and advancing scientific knowledge than in persuading others that he was doing so. He was professor of physiology in Brown University from 1886 to 1896, lecturer at the Harvard Medical School in 1909, in the Harvard-Massachusetts Institute of Technology School for Health Officers from 1913 to 1922, and in the Harvard School of Public Health from 1923 to 1935.

COURT DECISION ON PUBLIC HEALTH

Statute regulating sale of bedding or upholstered furniture held invalid.—(Massachusetts Supreme Judicial Court; *Mueller et al.* v. *Commissioner of Public Health et al.*, 30 N.E.2d 217; decided November 14, 1940.) A 1939 Massachusetts statute provided in part that an article of bedding or upholstered furniture, manufactured without the State by a manufacturer residing without the State and having no usual place of business within the State, could not be sold unless there was placed upon the tag required for such articles the name of such manufacturer and the serial number of the permit granted him by the State department of public health, which permit could be obtained only by the payment of an annual fee of $50.

The question of the constitutionality of the statute in this respect was presented to the Massachusetts Supreme Court when a Michigan copartnership, having no usual place of business in Massachusetts and no partner who resided there, sought to enjoin the enforcement of the law. The court was of the opinion that the statute was in violation of the Federal Constitution in that it laid an unreasonable burden on interstate commerce. It was said that it was well settled that the regulation of sales of articles to prevent fraud was within the legislative power and that the fact that the plaintiffs' products were made without the State did not prevent the adoption of reasonable regulations relative to their sale in the State, but the court further stated that it was also settled that no State could, consistently with the Federal Constitution, impose upon the products of other States,

brought therein for sale or use, or upon citizens because engaged in the sale therein, or the transportation thereto, of the products of other States, more onerous public burdens or taxes than it imposed upon the like products of its own territory. The court pointed out that the statute, as applied to manufacturers, required the payment of the fee as a condition precedent to the local sale of furniture manufactured outside the State by a manufacturer who did not reside or have a usual place of business in the State, but that it did not require this exaction as a condition precedent to the local sale of furniture manufactured outside the State by a manufacturer who had a usual place of business, or resided, in the State. "We are of opinion," said the court, "that the provisions of the statute in question amount to discrimination for which no reasonable explanation can be given or special circumstances can be said to negative."

DEATHS DURING WEEK ENDED JANUARY 25, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 25, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	10,472	9,645
Average for 3 prior years	9,321	
Total deaths, first 4 weeks of year	39,249	37,979
Deaths under 1 year of age	553	496
Average for 3 prior years	515	
Deaths under 1 year of age, first 4 weeks of year	2,257	2,189
Data from industrial insurance companies:		
Policies in force	64,729,355	66,405,318
Number of death claims	14,263	14,326
Death claims per 1,000 policies in force, annual rate	11.5	11.3
Death claims per 1,000 policies, 4 weeks of year, annual rate	10.3	10 3

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 1, 1941

Summary

Another decline in the incidence of influenza was recorded for the current week, with 72,578 cases reported, as compared with 96,652 for the preceding week. Decreases were reported from all geographic areas except the Middle Atlantic and West North Central States, where increases in New Jersey (from 377 to 1,579) and Minnesota (from 954 to 2,111) accounted for the rise. The highest current incidence (41,106 cases) was recorded for the South Atlantic States, which have reported the largest numbers of cases for the past three weeks. In this area, West Virginia (13,565 cases), Virginia (11,516), and South Carolina (8,645) reported the largest numbers of cases for the current week.

The Bureau of the Census reports 10,112 deaths in 88 major cities of the United States for the week ended February 1, as compared with 10,472 for the preceding week and a 3-year (1938–40) average of 9,586. The current figure is 526 above the 3-year average as compared with an excess of 1,151 for the preceding week. In 90 cities scattered throughout the United States, the deaths attributed to influenza have been above the 5-year (1936–40) average each week from December 28, 1940, to January 25, 1941, inclusive, while the deaths recorded from pneumonia have remained below the 5-year average for the same period.

Of the other 8 common communicable diseases reported weekly by the State health officers, only measles and whooping cough were above the 5-year median expectancy. The number of cases of poliomyelitis dropped from 37 for the preceding week to 18. One case of Rocky Mountain spotted fever was reported in Virginia and 1 case of tularemia each in Maryland and South Carolina. Of 25 cases of endemic typhus fever, 16 cases were in Georgia and 4 cases in South Carolina.

Telegraphic morbidity reports from State health officers for the week ended Feb. 1, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occured.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Feb. 1, 1941	Feb. 3, 1940		Feb. 1, 1941	Feb. 3, 1940		Feb. 1, 1941	Feb. 3, 1940		Feb. 1, 1941	Feb. 3, 1940	
NEW ENG.												
Maine	0	2	1	197	32	4	69	104	104	0	0	0
New Hampshire	0	0	0	27	-----	-----	48	16	34	2	0	0
Vermont	0	0	0	128	-----	-----	12	1	14	0	0	0
Massachusetts	2	4	4	-----	-----	-----	438	292	513	1	0	2
Rhode Island	0	0	0	23	-----	-----	0	128	100	0	0	0
Connecticut	0	1	3	623	8	8	44	143	143	1	1	1
MID. ATL.												
New York	13	27	31	[1] 632	[1] 19	[1] 19	2,456	254	706	0	1	12
New Jersey	22	10	10	1,579	42	42	813	34	55	2	1	3
Pennsylvania	9	43	51	-----	-----	-----	2,341	86	222	5	5	5
E. NO. CEN.												
Ohio	9	18	31	1,903	118	118	1,051	21	66	1	2	2
Indiana	16	18	29	291	363	28	105	10	12	1	1	1
Illinois	29	19	49	138	130	54	1,339	30	35	1	0	4
Michigan [2]	11	28	10	374	14	6	1,964	183	183	0	1	1
Wisconsin	0	1	1	414	42	51	554	230	230	0	0	0
W. NO. CEN.												
Minnesota	0	0	3	2,111	5	4	14	380	151	0	0	0
Iowa	9	1	4	574	11	11	138	72	45	0	0	1
Missouri	10	7	17	245	22	181	31	7	15	0	2	3
North Dakota	4	3	3	101	19	19	13	4	4	0	0	2
South Dakota [2]	0	0	3	13	2	1	31	37	31	0	0	1
Nebraska	0	1	3	-----	6	-----	3	45	25	0	0	0
Kansas	6	4	5	538	143	29	185	329	18	0	0	0
SO. ATL.												
Delaware	3	0	0	11	-----	-----	33	3	33	1	0	0
Maryland [2]	4	8	8	577	119	61	25	5	149	0	0	0
Dist. of Col.	2	9	9	124	24	5	14	0	13	0	0	0
Virginia [3]	9	12	25	11,516	2,450	-----	447	23	66	1	0	3
West Viginia [3]	8	9	13	13,565	175	175	54	15	15	2	2	4
North Carolina [4]	17	16	36	2,868	183	33	152	30	156	1	2	3
South Carolina [4]	6	3	5	8,645	1,674	772	114	5	18	9	2	2
Georgia [4]	8	6	8	3,588	1,104	259	93	46	46	3	1	2
Florida	7	5	11	212	20	10	11	30	30	2	0	1
E. SO. CEN.												
Kentucky	6	11	8	399	91	91	198	16	60	3	4	8
Tennessee	5	8	13	2,277	320	172	60	74	42	4	1	4
Alabama [4]	7	7	15	4,701	1,247	301	68	41	41	2	0	0
Mississippi [2]	3	5	5	-----	-----	-----	-----	-----	-----	1	0	1
W. SO. CEN.												
Arkansas	8	17	9	1,625	1,587	242	120	28	28	1	1	1
Louisiana [4]	8	9	12	308	121	24	3	3	6	2	0	0
Oklahoma	7	13	10	797	724	190	4	0	4	2	0	2
Texas	23	41	60	7,830	4,497	916	102	270	140	3	2	4
MOUNTAIN												
Montana	5	1	1	308	16	25	4	63	39	0	0	0
Idaho	1	0	0	922	2	4	14	125	31	0	0	0
Wyoming	1	2	0	182	4	-----	7	5	5	0	0	0
Colorado	6	6	6	385	24	-----	94	28	28	0	1	1
New Mexico	5	4	4	37	12	9	37	18	20	0	0	0
Arizona	3	12	5	408	288	125	85	4	8	0	1	1
Utah [2]	2	2	2	76	28	-----	4	255	39	0	0	0
Nevada	0	-----	-----	-----	-----	-----	0	-----	-----	0	-----	-----
PACIFIC												
Washington	0	0	5	83	324	2	81	1,180	182	0	0	0
Oregon	0	4	3	74	191	59	263	163	35	0	2	1
California	9	24	33	1,149	1,440	131	108	428	428	1	1	2
Total	303	421	617	72,578	17,641	4,310	13,844	5,264	6,351	52	34	86
5 weeks	1,523	2,250	3,124	456,208	65,597	17,075	54,263	20,897	25,152	218	163	463

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended Feb. 1, 1941, and comparison with corresponding week of 1940 and 5-year median—Contd.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Feb. 1, 1941	Feb. 3, 1940		Feb. 1, 1941	Feb. 3, 1940		Feb. 1, 1941	Feb. 3, 1940		Feb. 1, 1941	Feb. 3, 1940	
NEW. ENG.												
Maine	0	0	0	3	19	19	0	0	0	0	0	0
New Hampshire	0	0	0	10	3	6	0	0	0	1	0	0
Vermont	0	0	0	4	20	20	0	0	0	8	0	0
Massachusetts	0	0	0	127	119	228	0	0	0	1	3	2
Rhode Island	0	1	0	10	0	13	0	0	0	0	0	0
Connecticut	1	0	0	35	77	93	0	0	0	3	8	0
MID. ATL.												
New York	1	1	1	368	581	661	0	0	0	6	5	6
New Jersey	0	2	2	266	340	175	0	0	0	0	2	2
Pennsylvania	0	0	0	239	468	490	0	0	0	2	9	8
E. NO. CEN.												
Ohio	4	2	0	218	444	444	0	2	2	1	0	2
Indiana	0	0	0	145	206	211	2	4	5	0	2	1
Illinois	0	2	1	387	579	628	1	2	6	2	8	4
Michigan [3]	1	0	0	231	298	474	3	0	1	1	0	1
Wisconsin	0	1	1	145	172	260	15	2	5	0	0	1
W. NO. CEN.												
Minnesota	0	0	0	56	136	137	23	13	13	0	0	0
Iowa	1	1	0	75	74	186	0	5	33	5	3	3
Missouri	0	0	0	60	53	163	1	2	12	1	1	2
North Dakota	0	0	0	8	52	40	0	0	7	2	0	0
South Dakota [2]	1	0	0	12	25	29	1	6	11	0	0	0
Nebraska	0	0	0	13	25	70	1	0	4	0	0	0
Kansas	0	0	0	81	121	226	2	0	11	2	0	0
SO. ATL.												
Delaware	0	0	0	12	9	6	0	0	0	0	2	0
Maryland [3]	0	0	0	65	56	56	0	0	0	2	1	1
Dist. of Col	0	0	0	16	23	19	0	0	0	0	0	0
Virginia [3]	0	0	0	53	37	40	0	0	0	1	3	5
West Virginia [3]	0	0	1	33	54	46	0	0	0	2	0	2
North Carolina [4]	0	2	0	53	46	40	0	0	1	0	0	2
South Carolina [4]	0	1	1	11	4	7	0	0	0	1	3	2
Georgia [4]	1	2	1	29	19	20	0	0	0	1	1	2
Florida	2	0	0	7	21	13	0	0	0	2	1	1
E. SO. CEN.												
Kentucky	1	0	1	92	77	76	0	0	0	0	0	2
Tennessee	0	0	0	67	80	40	1	0	0	4	0	1
Alabama [4]	0	0	0	21	9	14	0	0	0	2	1	4
Mississippi [3]	1	1	1	19	10	10	0	0	1	0	2	2
W. SO. CEN.												
Arkansas	0	0	0	9	11	10	0	2	2	3	1	1
Louisiana [4]	1	0	0	6	15	15	0	0	0	7	5	6
Oklahoma	0	1	0	9	31	36	0	0	0	1	1	3
Texas	1	0	0	54	80	113	2	5	7	0	6	8
MOUNTAIN												
Montana	0	0	0	35	52	52	0	0	9	0	0	0
Idaho	0	1	0	17	0	13	1	0	8	0	0	0
Wyoming	0	0	0	8	5	15	0	0	0	0	0	0
Colorado	0	2	0	30	66	66	1	20	6	2	0	0
New Mexico	0	0	0	6	30	24	1	0	1	1	0	1
Arizona	0	0	0	15	8	13	0	1	1	2	1	1
Utah [3]	0	0	0	6	28	38	0	1	0	0	1	0
Nevada	0			0			0			3		
PACIFIC												
Washington	1	1	1	32	54	89	0	0	8	0	2	2
Oregon	0	1	1	17	34	45	0	0	5	1	2	0
California	1	9	2	115	197	236	1	6	10	8	0	5
Total	18	31	21	3,330	4,868	6,004	56	71	313	73	74	111
5 weeks	188	182	106	16,004	21,356	29,791	246	390	1,457	385	408	554

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended Feb. 1, 1941, and comparison with corresponding week of 1940 and 5-year median—Contd.

Division and State	Whooping cough, Week ended Feb. 1, 1941	Whooping cough, Week ended Feb. 3, 1940
NEW ENG.		
Maine	29	57
New Hampshire	6	2
Vermont	16	23
Massachusetts	186	144
Rhode Island	11	17
Connecticut	59	74
MID. ATL.		
New York	315	430
New Jersey	132	93
Pennsylvania	364	372
E. NO. CEN.		
Ohio	336	205
Indiana	14	45
Illinois	125	91
Michigan [2]	301	120
Wisconsin	130	175
W. NO. CEN.		
Minnesota	76	52
Iowa	31	4
Missouri	41	19
North Dakota	15	26
South Dakota [2]	7	5
Nebraska	46	6
Kansas	67	36
SO. ATL.		
Delaware	25	2
Maryland [2]	92	127
Dist. of Col.	8	9
Virginia [3]	138	62
West Virginia [2]	55	7
SO. ATL.—continued		
North Carolina [4]	231	53
South Carolina [4]	91	17
Georgia [4]	18	13
Florida	4	9
E. SO. CEN.		
Kentucky	72	63
Tennessee	73	27
Alabama [4]	45	22
Mississippi [2]		
W. SO. CEN.		
Arkansas	28	1
Louisiana [4]	9	22
Oklahoma	15	1
Texas	249	107
MOUNTAIN		
Montana	21	1
Idaho	22	2
Wyoming	0	22
Colorado	44	50
New Mexico	21	45
Arizona	26	9
Utah [2]	57	139
Nevada	0	
PACIFIC		
Washington	113	35
Oregon	2	29
California	419	194
Total	4,185	3,073
5 weeks	21,042	13,490

1 New York City only.
2 Period ended earlier than Saturday.
3 Rocky Mountain spotted fever, week ended February 1, 1941, cases. Virginia, 1.
4 Typhus fever, week ended February 1, 1941, 25 cases, as follows North Carolina, 1; South Carolina, 4; Georgia, 16; Alabama, 2; Louisiana, 2.

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 18, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	166	1, 295	135	2, 288	947	1, 645	33	366	19	1, 108	--------
Current week[1]	70	7, 346	140	3, 961	687	1, 076	16	332	20	1, 132	--------
Maine:											
Portland	0	14	1	0	2	1	0	0	0	8	23
New Hampshire:											
Concord	0	------	0	0	0	0	0	1	0	0	14
Manchester	0	------	1	0	3	10	0	1	0	0	25
Nashua	0	------	0	0	0	2	0	0	0	0	8
Vermont:											
Barre	0	------	1	0	0	1	0	1	0	0	5
Burlington	0	------	0	0	0	0	0	0	0	0	11
Rutland	0	------	0	0	1	0	0	0	0	0	5
Massachusetts:											
Boston	1	------	5	153	53	35	0	11	1	89	363
Fall River	1	------	0	0	2	5	0	2	0	3	40
Springfield	0	------	0	2	1	13	0	0	0	1	42
Worcester	0	------	0	71	10	10	0	5	0	0	76
Rhode Island:											
Pawtucket	0	------	0	0	2	2	0	0	0	0	24
Providence	0	16	2	0	10	3	0	3	0	13	77
Connecticut:											
Bridgeport	0	59	1	0	4	3	0	0	0	3	51
Hartford	0	259	0	0	2	3	0	1	0	4	52
New Haven	0	6	0	0	2	13	0	0	0	12	38
New York:											
Buffalo	0	15	1	42	13	21	0	5	0	29	157
New York	16	215	3	989	76	184	0	75	4	103	1, 571
Rochester	0	------	0	1	7	2	0	1	2	19	84
Syracuse	0	------	0	0	6	6	0	1	0	12	58
New Jersey:											
Camden	2	8	2	38	6	10	0	1	0	3	36
Newark	0	11	0	122	6	38	0	2	0	25	104
Trenton	0	5	0	10	6	46	0	0	0	1	46
Pennsylvania:											
Philadelphia	5	40	10	619	39	72	0	17	0	97	594
Pittsburgh	0	80	5	4	21	9	0	6	1	64	178
Reading	1	------	0	113	7	0	0	1	0	3	36
Scranton	1	------	--------	2	-------	0	0	-------	0	2	-------
Ohio:											
Cincinnati	0	41	1	12	11	9	0	7		2	130
Cleveland	0	192	1	232	14	30	0	8	0	116	187
Columbus	1	----	0	8	7	8	0	2	0	20	95
Toledo	0	2	2	6	1	8	0	3	0	15	68
Indiana:											
Anderson	0	------	1	0	1	1	0	0	0	0	18
Fort Wayne	0	------	0	4	3	0	0	1	0	0	30
Indianapolis	2	------	3	7	13	16	0	3	0	8	116
Muncie	0	------	0	1	2	2	0	0	0	0	14
South Bend	0	-----	0	6	3	2	0	0	0	0	23
Terre Haute	0	-----	0	0	0	0	0	0	0	1	13
Illinois:											
Alton	0	------	0	0	5	1	0	0	0	0	14
Chicago	6	34	4	655	27	174	0	27	1	86	719
Elgin	0	------	0	4	2	1	0	0	0	0	18
Moline	0	------	0	0	0	0	0	0	0	0	12
Springfield	0	------	0	0	1	1	0	0	0	0	32
Michigan:											
Detroit	2	31	2	606	16	89	3	17	0	154	276
Flint	0	------	1	20	4	9	0	2	0	11	24
Grand Rapids	0	1	0	12	2	4	0	0	0	25	38
Wisconsin:											
Kenosha	0	1	0	7	0	1	0	0	0	0	7
Madison	0	------	0	0	0	0	0	0	0	1	13
Milwaukee	0	------	0	13	5	25	0	1	1	21	88
Racine	0	------	0	0	0	1	0	0	0	5	7
Superior	0	------	0	0	1	0	0	0	0	0	7

[1] Figures for Boise estimated; report not received.

City reports for week ended Jan. 18, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	1	1	2	8	0	0	1	30
Minneapolis	0	------	1	3	5	15	0	0	0	28	109
St Paul	0	------	0	0	7	6	0	1	0	10	56
Iowa:											
Cedar Rapids	0	------	------	0	------	2	0	------	0	0	------
Davenport	0	------	------	1	------	8	0	------	0	0	------
Des Moines	1	------	0	0	0	5	0	0	0	1	46
Sioux City	0	------	------	0	------	1	0	------	0	1	------
Waterloo	0	------	------	0	------	1	0	------	0	3	------
Missouri:											
Kansas City	0	1	3	6	17	10	4	3	0	18	100
St. Joseph	0	------	1	2	16	0	0	0	0	0	44
St. Louis	3	35	0	7	30	43	0	4	0	20	267
North Dakota:											
Fargo	0	120	------	0	------	1	0	------	0	4	------
Grand Forks	0	------	------	0	------	0	0	------	1	0	------
Minot	0	------	0	2	0	1	0	0	0	2	6
South Dakota:											
Aberdeen	0	------	------	0	------	2	0	------	0	0	------
Sioux Falls	1	------	0	0	0	3	0	0	0	0	9
Nebraska:											
Omaha	0	------	1	1	6	3	1	2	0	0	59
Kansas:											
Lawrence	0	57	1	5	1	0	0	0	0	0	8
Topeka	0	27	0	24	6	0	0	0	0	2	26
Wichita	0	13	0	3	6	2	0	0	0	15	31
Delaware:											
Wilmington	0	3	0	2	5	1	0	1	0	2	36
Maryland:											
Baltimore	0	64	3	7	20	27	0	12	1	59	218
Cumberland	0	------	0	0	0	1	0	0	0	0	12
Frederick	0	------	0	0	0	0	0	0	1	0	6
District of Columbia:											
Washington	2	172	0	4	14	18	0	11	0	14	199
Virginia:											
Lynchburg	1	------	0	0	2	2	0	1	0	0	11
Norfolk	0	216	0	6	2	1	0	0	0	2	30
Richmond	0	------	2	5	6	6	0	1	0	0	55
Roanoke	0	------	1	71	2	0	0	0	0	5	20
West Virginia:											
Charleston	0	8	0	0	1	0	0	0	0	0	12
Huntington	0	------	------	0	------	1	0	------	0	0	------
Wheeling	0	9	0	1	3	0	0	0	0	15	37
North Carolina:											
Gastonia	1	4	------	0	------	0	0	------	0	1	------
Raleigh	0	12	------	0	0	0	0	0	0	5	5
Wilmington	0	------	0	0	2	0	0	0	0	1	11
Winston-Salem	2	22	------	0	2	2	0	0	0	31	36
South Carolina:											
Charleston	1	1,537	1	6	6	0	0	0	0	0	28
Florence	0	42	0	11	1	0	0	0	0	0	8
Greenville	0	------	0	0	6	2	0	0	0	4	21
Georgia:											
Atlanta	0	1,417	6	5	10	4	0	2	0	0	103
Brunswick	0	12	0	0	2	0	0	1	0	4	8
Savannah	0	614	2	0	3	0	0	0	0	0	41
Florida:											
Miami	0	6	0	1	2	1	0	5	0	0	48
Tampa	1	8	1	0	1	1	0	0	1	1	30
Kentucky:											
Ashland	0	17	1	0	0	0	0	2	0	5	9
Covington	0	6	0	3	2	1	0	1	0	0	22
Lexington	0	------	0	12	5	0	0	1	0	5	21
Louisville	1	58	1	2	13	14	0	4	0	15	120
Tennessee:											
Knoxville	0	795	6	1	6	2	0	0	0	7	32
Memphis	0	------	9	15	4	5	0	7	0	2	110
Nashville	0	------	58	4	5	3	0	1	0	8	68
Alabama:											
Birmingham	0	667	1	8	6	2	0	3	0	3	84
Mobile	1	244	4	1	3	0	0	3	0	0	89
Montgomery	1	31	------	0	------	2	0	------	0	0	------

City reports for week ended Jan. 18, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	1	26	-------	0	-------	0	0	-------	0	2	-------
Little Rock	0	148	1	0	10	1	0	4	0	2	62
Louisiana:											
Lake Charles	0	1	0	0	0	0	0	0	0	2	3
New Orleans	2	9	2	2	13	0	0	8	5	0	192
Shreveport	0	9	2	0	7	0	0	3	0	0	54
Oklahoma:											
Oklahoma City	3	116	1	2	8	4	0	2	4	2	51
Tulsa	0	------	0	1	1	4	1	0	0	8	7
Texas:											
Dallas	2	8	6	3	2	1	0	5	0	0	83
Fort Worth	0	------	3	39	3	5	0	2	0	0	38
Galveston	0	------	0	0	2	0	0	0	0	0	19
Houston	2	324	7	1	19	3	0	6	0	0	115
San Antonio	0	110	6	1	13	3	0	12	0	2	81
Montana:											
Billings	0	1	0	0	1	1	0	0	0	0	8
Great Falls	1	------	0	0	1	3	0	0	0	0	11
Helena	0	123	0	0	0	0	0	0	0	0	3
Missoula	0	174	0	0	1	2	0	0	0	0	7
Idaho:											
Boise	------	------	------	------	------	------	------	------	------	------	------
Colorado:											
Colorado Springs	0	------	0	0	1	0	0	1	0	2	12
Denver	4	103	5	6	10	10	0	4	0	16	126
Pueblo	1	------	4	1	5	0	0	1	0	6	16
New Mexico:											
Albuquerque	0	4	0	3	1	2	0	2	0	1	11
Utah:											
Salt Lake City	0	------	2	2	1	3	0	2	0	8	33
Washington:											
Seattle	1	------	2	9	7	5	0	0	1	15	96
Spokane	0	1	3	1	1	3	0	1	0	0	30
Tacoma	0	------	0	2	0	1	0	1	1	1	37
Oregon:											
Portland	0	26	3	6	2	2	0	1	0	0	92
Salem	0	3	-------	0	-------	0	0	-------	0	3	-------
California:											
Los Angeles	4	188	6	9	10	31	0	17	0	39	371
Sacramento	4	15	2	2	1	4	0	4	0	6	42
San Francisco	1	120	5	0	10	7	0	10	0	51	194

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Missouri:			
Buffalo	1	0	0	St. Joseph	0	0	1
New York	2	0	0	St. Louis	1	0	0
New Jersey:				District of Columbia:			
Trenton	1	0	0	Washington	0	0	1
Pennsylvania:				Tennessee:			
Pittsburgh	2	0	1	Memphis	1	1	0
Ohio:				Alabama:			
Cleveland	0	0	1	Birmingham	0	1	0
Illinois:				Louisiana:			
Chicago	0	0	1	Shreveport	0	1	0
Michigan:				California:			
Detroit	0	0	1	Los Angeles	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Toledo, 1; Charleston, S. C., 1.
Pellagra.—Cases: Atlanta, 1; San Antonio, 1.
Rabies in man.—Deaths: Cincinnati, 1.
Typhus fever.—Cases: Charleston, S. C., 1; Atlanta, 1; Savannah, 1; Mobile, 1; New Orleans, 1; Houston, 1; Los Angeles, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague.—A rat found on December 30, 1940, at Honokaa, Hamakua District, Island of Hawaii, T. H., has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 28, 1940.—During the week ended December 28, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	2	6	2	13	3	1	1	1	30
Chickenpox		21	3	69	372	33	29	49	22	598
Diphtheria		19		20		3	1			43
Influenza		961			343	19			233	1,556
Lethargic encephalitis					1					1
Measles		251	8	14	412	155	41	105	113	1,129
Mumps				17	66	7	3		1	94
Pneumonia		31			45	3			4	83
Scarlet fever		20	5	61	132	18	5	10	4	255
Tuberculosis		41	8	36	26	3		1		115
Typhoid and paratyphoid fever			1	5		1			1	8
Whooping cough		1		43	117	12	6	5		184

CUBA

Habana—Communicable diseases—4 weeks ended December 14, 1940.—During the 4 weeks ended December 14, 1940, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	26		Scarlet fever	1	
Malaria	5	1	Typhoid fever	37	11
Poliomyelitis	2	1			

FINLAND

Communicable diseases—4 weeks ended November 30, 1940.—During the 4 weeks ended November 30, 1940, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	260	Scarlet fever	490
Influenza	10,872	Typhoid fever	42
Paratyphoid fever	265	Undulant fever	1
Poliomyelitis	26		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of January 31, 1941, pages 206–210. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Yellow Fever

Colombia.—Deaths from yellow fever have been reported in Colombia as follows: Cundinamarca Department, Dec. 12, 1940, 1; Intendencia of Meta, Nov. 20–Dec. 29, 1940, 5; Santander Department, Jan. 3, 1941, 1; Tolima Department, Nov. 25–Dec. 22, 1940, 6.

Ivory Coast—Abengorou.—On January 24, 1941, 1 death from suspected yellow fever was reported in Abengorou, Ivory Coast.

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Public Health Reports

VOLUME 56 FEBRUARY 14, 1941 NUMBER 7

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

December 29, 1940–January 25, 1941

The accompanying table (table 2) summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended January 25, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—The number of cases of influenza continued to increase during the first 3 weeks of the 4-week period ended January 25, but decreased considerably during the fourth week. The number of cases reported weekly was as follows: Week ended January 4, 12,905, January 11, 89,828, January 18, 120,006, and January 25, 96,652 cases. The total of 383,630 cases was the highest reported for this period since 1929, when a total of approximately 425,000 cases occurred during this period. During the 1932–33 epidemic there were approximately 144,000 cases reported for this period. The number of cases was almost seven and one-half times the number recorded in 1940 and more than 30 times the 1936–40 median figure for this period.

The current epidemic started in the Mountain and Pacific regions and spread rapidly into the southern areas. For the current period 200,218 cases, or more than 50 percent of the total, were reported from the South Central region, and more than 30 percent from the South Atlantic region (114,502 cases). States in those regions reporting the highest incidence were: Texas (109,820 cases); Kentucky (20,667); Alabama (19,188); Virginia (32,412); South Carolina (28,002); Georgia (25,523); and West Virginia (23,354).

Increases were also noted in the New England and North Central regions, but the incidence in those regions has been low as compared

with the southern and western regions. Maine with approximately 5,000 cases, New Hampshire with about 2,000, and Connecticut with 2,708 cases were mostly responsible for an excess of cases in the New England region; Ohio reported 6,895 of approximately 10,000 cases occurring in the East North Central region, and Kansas reported 8,406 of the 12,169 cases reported from the West North Central region. Further increases may be expected in those regions, as the maximum incidence up to that date was reported during the week ended January 25. In the Mountain and Pacific regions the peak was reached during the week ended December 21 with approximately 27,000 reported cases, while in the South Central regions the maximum weekly incidence was reported during the week ended January 11, and it is probable that the week ended December 25 will be the peak week in the South Atlantic region.

Mortality from all causes for the total number of cities reporting shows some excess during this period, the rate for January being 13.7 per 1,000 compared with an average rate for the years 1938–40 of 13.1 per 1,000. This excess in mortality from all causes is a reflection of the current influenza epidemic. The death rate for pneumonia as reported to the Public Health Service is below the average of the previous 3 years for January, while the death rate for influenza is well above the average rate for the 3 previous years.

Mortality from all causes is further analyzed in table 1, where rates are shown for the 4 weeks of January for nine geographic sections of the United States. In the Pacific section where the current influenza epidemic first appeared, mortality from all causes was somewhat above normal during December (not shown in the table), and has continued slightly above normal during January. In the Mountain and the two West Central sections, mortality from all causes was definitely above normal during the first week in January and has continued to be slightly above normal in the later weeks of January. In the East South Central section, mortality from all causes was slightly above normal during the second and third weeks of January. In the East North Central, Middle Atlantic, and South Atlantic sections there has also been only a slight increase in mortality from all causes, occurring mainly in the last week of January. In the New England States mortality from all causes has been higher than average throughout January, with a marked increase in the rates for the latter half of the month.

Later reports (week ended February 1) indicate a still further decline in the number of cases in practically all sections of the country. For the country as a whole, the cases totaled approximately 73,000, as compared with 96,652 cases for the week ended January 25 and approximately 120,000 for the week ended January 18.

TABLE 1.—*Mortality from all causes in cities in 9 geographic sections of the United States for the 4 weeks of January 1941 compared with an average of the 3 preceding*

Section	Death rate per 1,000 (annual basis)			
	Jan. 4	Jan. 11	Jan. 18	Jan. 25
All cities reporting.				
1941	12 9	13 7	13.5	14.6
Average, 1938-40	13 1	13.1	12.9	13.2
Pacific.				
1941	13.8	16.6	13.7	15.4
Average, 1938-40	13.4	14.0	14 0	13.6
Mountain.				
1941	21.5	16 7	17 4	15.3
Average, 1938-40	15.3	13.3	13.5	14 6
West North Central.				
1941	15 0	13 1	13.9	14.1
Average, 1938-40	13 4	13 2	12.8	13 6
West South Central:				
1941	20 7	18 3	18 7	17 9
Average, 1938-40	17.8	16 2	16.7	17 3
East South Central:				
1941	14 1	16 3	18 5	17 4
Average, 1938-40	16 1	15 5	14 5	18 6
East North Central.				
1941	11 1	11.8	11 3	12 6
Average, 1938-40	11.6	12.1	11 4	11.2
Middle Atlantic.				
1941	12 3	13 2	13 2	14 4
Average, 1938-40	13 1	12 8	12 9	13 2
South Atlantic.				
1941	13 1	14 9	14.4	16 0
Average, 1938-40	14 6	14 5	14 4	14 0
New England				
1941	14 8	16 4	19 8	20 8
Average, 1938 40	13 6	15 1	13.5	14 8

[1] Based on data received from the Bureau of the Census.

Measles.—The number of cases (40,419) of measles reported for the current period was more than two and one-half times the number reported for the corresponding period in 1940 and more than twice the 1936–40 median number of cases for this period. Excesses over the seasonal expectancy were reported from the Middle Atlantic, East North Central, and East South Central regions, but in all other regions the incidence was relatively low. In the Middle Atlantic region the number of cases was more than three and one-half times the normal expectancy, and in the East North Central region the number was almost six times the median figure for the period. In the Pacific region, where the disease was unusually prevalent at this time last year, the number of cases was less than one-fourth of last year's incidence, as well as of the 1936–40 median which is represented by the 1940 figure.

Poliomyelitis.—While the incidence of poliomyelitis declined still further during the current period, the number of cases (170) reported was the highest recorded since 1931 when the cases for this period totaled 194. The disease was most prevalent in the Middle and South Atlantic regions and in the North Central regions. In the East North Central region, Wisconsin reported 24 cases, Ohio 14, and Illinois 11 cases; Florida (7 cases) and West Virginia (6 cases) reported the largest

numbers of cases in the South Atlantic region and New York, in the Middle Atlantic region, reported 19 cases. No more than 5 cases were reported from any other State. A further decline in this disease may be expected as the lowest incidence is usually reached during the months of April and May.

Whooping cough.—There were a few more cases of whooping cough than might normally be expected, the cases (16,857) reported for the current period being about 60 percent above last year's figure for this period and almost 10 percent above the 1938–40 median incidence. Each region except the Mountain contributed to the excess incidence.

TABLE 2.—*Number of reported cases of 9 communicable diseases in the United States during the 4-week period Dec. 29, 1940–Jan. 25, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40*

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	194	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,220	1,829	2,491	383,630	51,859	12,765	40,419	15,635	18,801
New England	9	53	53	10,051	124	118	2,030	2,583	2,994
Middle Atlantic	180	230	368	1,430	155	155	17,959	1,265	4,863
East North Central	179	351	517	10,012	4,595	621	13,144	2,371	2,371
West North Central	131	119	225	12,169	1,079	919	1,473	1,976	1,976
South Atlantic	250	420	514	114,502	25,134	5,419	2,171	584	2,776
East South Central	109	174	205	52,709	5,278	2,284	1,149	421	421
West South Central	232	297	377	147,509	10,968	3,908	524	883	989
Mountain	58	73	93	21,699	2,383	761	1,061	1,126	1,390
Pacific	72	112	154	13,549	2,143	644	908	4,426	4,426
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	163	129	377	170	151	85	12,674	16,487	23,617
New England	10	7	11	1	4	1	779	917	1,661
Middle Atlantic	29	33	62	23	13	8	3,314	4,190	4,828
East North Central	18	21	45	60	16	16	4,229	5,490	8,142
West North Central	8	9	28	17	20	7	1,260	1,891	3,676
South Atlantic	34	20	77	28	18	16	1,111	1,287	1,183
East South Central	22	21	66	11	10	10	688	629	620
West South Central	22	3	25	11	14	9	352	533	711
Mountain	4	8	17	7	14	3	342	569	750
Pacific	16	7	16	12	42	15	599	981	1,481
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	190	320	1,144	312	329	458	16,857	10,405	[3] 15,918
New England	0	0	0	9	19	17	1,551	1,500	1,500
Middle Atlantic	0	0	0	42	57	66	4,481	8,463	8,463
East North Central	64	59	194	46	45	45	3,647	1,859	2,294
West North Central	76	122	450	28	16	39	947	475	475
South Atlantic	3	8	11	48	55	89	2,695	835	2,164
East South Central	5	0	6	26	12	38	466	322	322
West South Central	9	47	47	66	74	101	868	362	469
Mountain	25	64	166	22	33	26	560	713	713
Pacific	8	20	120	25	18	82	1,642	876	876

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three-year (1938–40) median.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended January 25 there were 1,220 cases of diphtheria reported, as compared with 1,829, 2,491, and 2,761 cases for the corresponding period in 1940, 1939, and 1938, respectively. The situation was favorable in all sections of the country. In the West North Central region the incidence was slightly higher than during the corresponding period in 1940, but the number of cases was still well below the 1936–40 median incidence for this period. For the country as a whole the number of cases was the lowest on record for this period.

Meningococcus meningitis.—For the current period, there were 163 cases of meningococcus meningitis reported, representing an increase of more than 25 percent over the incidence for the corresponding period in 1940. The incidence was, however, less than 50 percent of the 1936–40 median figure for this period. Regions along the North and South Atlantic Coast and the West South Central and Pacific regions reported excesses during the current period over last year; the Middle Atlantic, East North Central, and Mountain regions reported fewer cases, and in the West North Central and East South Central regions approximately the same incidence was recorded as for last year. In most regions, however, the number of cases was below the preceding 5-year median. This disease has stood at a relatively low level since 1936 when 668 cases were reported for this period; the current incidence represents the first increase over a preceding year's incidence during this period since that year.

Scarlet fever. For the country as a whole, the incidence (12,674 cases) of scarlet fever for the 4-week period under report was approximately 75 percent of that reported for the corresponding period in 1940 and about 50 percent of the 1936–40 median figure for this period. In the South Atlantic and East South Central regions the incidence stood at about the normal seasonal level; but all other regions reported decreases from last year's figures, as well as very significant declines from the median figures for this period.

Smallpox.—The number of reported cases (190) of smallpox was the lowest on record for this period. Of the total number of cases, Minnesota reported 30, Wisconsin 29, Colorado 23, and Iowa and Michigan 21 each. About two-thirds of the cases were reported from those five States. This disease has been on a steady decline since 1938 when 2,435 cases were reported for the period corresponding to the one under consideration.

Typhoid fever.—The number of cases of typhoid fever reported for the current period was 312, only slightly less than the number reported for the corresponding period in 1940, but about 30 percent lower than the 1936–40 median incidence for this period. In the East North

Central and Mountain regions the incidence was about normal but all other regions reported a relatively low incidence.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended January 25, based on data received from the Bureau of the Census, was 13.7, as compared with 12.8 in 1940 and an average of 13.1 for the corresponding period in the years 1938–40. By weeks for the current period the rates were 12.9, 13.7, 13.5, and 14.6, respectively. The cause of the increase in the death rate is apparently influenza; further discussion is found under that subject.

THE RESPONSE OF PERITONEAL TISSUE TO INDUSTRIAL DUSTS [1]

By JOHN W. MILLER, *Pathologist*, and R. R. SAYERS,[2] *Senior Surgeon, United States Public Health Service*

The reaction of the peritoneal tissue to injected dusts has been described in previous reports [3] and attention has been called to the possibility of using the results of such a biological response to predict the pneumoconiosis-producing potentialities of industrial dusts. From time to time, minor modifications in the method of introducing the dusts into the animals have been made to simplify the procedure without altering the results.

As now practiced, the test is briefly as follows: Two cubic centimeters of a 5-percent suspension of air-elutriated (or 325-mesh screened), heat-sterilized dust in sterile, physiological saline solution is injected into the peritoneal cavities of a number of guinea pigs. Animals are killed and examined 14, 45, and 90 days after injection (in earlier experiments at intervals up to 1 year). The nodules produced by the dust on the anterior abdominal walls or in the omentum at the various intervals are compared. The gross appearance is usually sufficient for interpretation of results.

Three general types of reaction are produced by the various dusts. These have been designated as absorptive, proliferative, and inert.

Dusts of the absorptive group produce nodules which progressively decrease in size as the interval between injection and examination increases. Eventually the dust disappears from the peritoneal tissue.

---

[1] From the Division of Industrial Hygiene, National Institute of Health.

[2] Director of the Bureau of Mines.

[3] Miller, J. W., and Sayers, R. R.: The response of peritoneal tissue to dusts introduced as foreign bodies. Pub. Health Rep., 49: 80–89 (January 19, 1934) (Reprint No. 1608). J. Am. Med. Assoc., 103: 907–912 (September 22, 1934). Am. J. Pub. Health, 25: 452–456 (April 1935). Pub. Health Rep., 51:1677–1689 (December 4, 1936) (Reprint No. 1787).

Miller, J. W., and Sayers, R. R.: Microscopic appearance of experimentally produced dust nodules in the peritoneum. Pub. Health Rep., 50: 1619–1628 (November 15, 1935) (Reprint No. 1717).

Microscopically, a typical early nodule consists of a mass of the dust mixed with fine, granular, necrotic material. A zone of fibroblasts with an occasional macrophage surrounds this more or less centrally placed mass. With time the necrotic material becomes less and finally disappears. Brown pigment particles, apparently of endogenous origin, are usually found rather early, and in an experiment of a year's duration are the only evidence that the dust was introduced into the peritoneal cavity.

Dusts causing a proliferative type of reaction produce nodules which progressively increase in size as the interval between injection and examination increases. The maximum growth, using a 0.1-gm. dose for each guinea pig, is reached in about 90 days. Microscopically the nodules 7 days after injection are similar to those produced by the dusts of the absorptive group. As the process continues, the fibroblasts in the cellular zone about the central mass of dust and necrotic material are largely replaced by macrophages which are usually filled with dust particles. This is most marked in the 30-day series. Later, the engulfed dust particles appear to decrease in numbers and fibroblasts and adult connective tissue cells predominate. The area of necrotic material persists throughout the duration of the test. After 90 days fat cell formation in the cellular zone and calcification of the necrotic material is noted. All of the dusts classified in this group studied thus far are various forms of naturally occurring silica.

The nodules produced by the inert group of dusts are, in the early stages, grossly similar to those of the other two groups. As the interval between injection and examination increases the nodules become flattened with irregular edges, and numerous dispersed particles are present in the adjacent peritoneum. These are often found a considerable distance from the original nodules. The amount of dust found in the peritoneal cavity 1 year after injection is essentially the same as noted in 7 days. Histologically, the fibroblast is the early predominating cell. An increase in macrophages is noted at the 30-day interval and eventually fibrous tissue and accompanying fat cells predominate. No necrosis is noted at any interval in the entire process. The response is characteristic of that caused by a nonirritating foreign body.

It has been possible to correlate the response of peritoneal tissue to certain dusts with the results of X-ray examination or of post-mortem study of workers exposed by inhalation to high concentrations of the same dusts for protracted periods of time. These records are far from complete, because medical and roentgenographic surveys are available for only a limited number of the dusty trades. Nevertheless, the preliminary results of such comparisons can be summarized: (*a*) No cases of pneumoconiosis have been reported and confirmed among workers exposed solely to dusts of the absorptive group; (*b*) all

of the dusts so far examined that fall into the proliferative group are known to produce a nodular, pulmonary fibrosis (silicosis); (c) pneumoconioses caused by dusts of the inert group (asbestos,[4] anthracite mine dusts,[5] bisque ware,[6] mica,[7] pyrophyllite,[8] and talc[9]) have been reported as a result of X-ray examination of industrial workers. Where autopsy material is available, certain of the dusts of this group are known to produce a diffuse, interstitial, pulmonary fibrosis, or a mixed nodular and diffuse fibrosis, such as is produced by anthracite coal containing free silica.

Interpretation of the response produced by a dust in the peritoneal tissue in animals can be used as an index to determine the potential harmfulness of an industrial dust to which workers are exposed. Thus, an absorptive reaction can indicate that the dust is relatively harmless, while a proliferative response would indicate the dust to be definitely harmful. The dusts producing an inert reaction have been considered as less hazardous than those producing a proliferative reaction, and more dangerous than those of the absorptive group. The intraperitoneal method of studying the physiological action caused by dusts is not applicable to highly toxic material, a sublethal dose of which is too small to be grossly visible in the peritoneal tissue, or to dusts that are readily soluble.

The following dusts have been examined by this method and the results, with pertinent identifying data, are given below.

DUSTS CAUSING AN ABSORPTIVE REACTION

Calcite.—A pure mineral dust. Chemical analysis: Acid insoluble matter, 0.0 percent; silica, 0.0 percent. Petrographic examination: A calcite of high purity.

Calcite.—A pure mineral dust. Chemical analysis: Acid insoluble matter, 0.1 percent, all of which was silica. Petrographic examination: A calcite of high purity.

Precipitated calcium carbonate.—A chemical byproduct. An industrial dust. Chemical analysis: Silica, 0.4 percent; calcium carbonate, 87.9 percent; magnesium carbonate, 10.1 percent; magnesium oxide, 0.1 percent; iron and aluminum oxides, 0.6 percent. Petrographic examination: Precipitated calcium carbonate, about 98 percent; crystals, probably sodium carbonate, about 2 percent.

Gypsum.—The uncalcined, natural mineral. An industrial dust. Chemical analysis: Silica, 1.3 percent; calcium sulfate, 97.1 percent. Petrographic examination: Gypsum, about 70 percent; calcite, about 30 percent.

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[8] Easom, H. F., Trice, M. F., and Carpenter, C. C.: A study of the effects of exposure to dust in the mining and milling of pyrophyllite. Report, North Carolina State Board of Health, February 1939.

[9] Dreessen, W. C., and DallaValle, J. M.: Effects of exposure to dust in two Georgia talc mills and mines. Pub. Health Rep., 50: 131-143 (February 1, 1935) (Reprint No. 1669).

Limestone.—An industrial dust. Chemical analysis: Silica, 1.5 percent; calcium oxide, 54.4 percent; magnesium oxide, 0.4 percent; iron and aluminum oxides, 0.4 percent. Petrographic examination: Irregularly rounded calcite. No impurities noted.

Limestone.—An industrial dust. Chemical analysis: Silica, 2.73 percent; calcium carbonate, 95.21 percent; magnesium carbonate, 1.17 percent. Petrographic examination: A dolomitic limestone. No impurities observed.

Limestone.—An industrial dust. Chemical analysis: Acid insoluble matter, 7.2 percent; silica, 5 percent. Petrographic examination: Only an infrequent quartz crystal was noted. A high calcium carbonate content.

Limestone.—An industrial dust. Chemical analysis: Silica, 11.7 percent; calcium carbonate, 81.7 percent; magnesium oxide, 3.4 percent; ferric oxide, 1.4 percent; aluminum oxide, 1.5 percent. Petrographic examination: About 10 percent quartz and about 90 percent calcite.

Portland cement.—An industrial dust. Chemical analysis: Silica, 21.1 percent; calcium oxide, 74.4 percent; magnesium oxide, 2.8 percent. Petrographic examination: Normal portland cement.

Pyrolusite.—An industrial dust. Chemical analysis: Manganese, 54.9 percent. Petrographic examination: No quartz observed. This material was much more slowly absorbed than the others given here.

DUSTS CAUSING A PROLIFERATIVE REACTION

Bisque ware.—An industrial dust. Ground semivitreous pottery bisque ware, fired at a relatively low temperature. Chemical analysis: Silica, 72.0 percent. Petrographic examination: Quartz, about 40 to 50 percent. The remainder is semifused clay and feldspar.

Chert.—An industrial dust. Chemical analysis: Total silica, 76.1 percent. Petrographic examination: Quartz and chert, about 60 percent (about 25 percent of the silica is normal quartz). Calcite, about 40 percent.

Diatomite.—An industrial dust. Chemical analysis: Silica, 92.5 percent; aluminum oxide, 3.5 percent; ferric oxide, 1.5 percent; calcium oxide, 0.4 percent; magnesium oxide, 0.7 percent. Petrographic examination: Pure diatomite. No quartz or calcite present.

Greenware.—An industrial dust. Ground semivitreous, unfired pottery ware. Chemical analysis: Silica, 69.0 percent. Petrographic examination: Quartz, about 50 percent; feldspar, about 15 percent; clay, about 35 percent.

Greenware.—An industrial dust. Ground vitreous, unfired pottery ware. Petrographic examination: Higher quartz and less feldspar than the above. Clay, about the same amount.

Porcelain enamel frit.—An industrial dust. Chemical analysis: Silica, 35 to 50 percent; the remainder is oxides of antimony, zinc, and aluminum, and fluorides of sodium, aluminum, and calcium. Analysis varies within the above silica limits.

Quartz.—A pure mineral dust. Chemical analysis: Silica, 99.4 percent. Petrographic analysis: Normal crystalline quartz of high purity.

Quartz.—A pure mineral dust. Chemical analysis: Silica, 99.3 percent. Petrographic examination: Normal crystalline quartz of high purity.

Quartz.—An industrial dust. Chemical analysis: Silica, 99.1 percent. Petrographic examination: Normal quartz.

Quartz.—An industrial dust. Petrographic examination: Normal crystalline quartz of high purity.

Quartz.—An industrial dust. Identical with the above sample but treated with 0.6 percent crude pine fatty acids.

Quartz-sericite.—The source of this dust is not known. Chemical analysis: Total silica, 81.04 percent; calcium oxide, 0.30 percent; magnesium oxide, 0.45 percent; sodium oxide, 0.10 percent; potassium oxide, 0.98 percent; iron oxide, 0.25 percent; aluminum oxide, 14.26 percent; total water, 2.61 percent. Petrographic examination: Quartz, about 50 percent; muscovite (variety, sericite), about 45 percent; fibrous sericite, less than 5 percent.

Tripoli.—An industrial dust. Chemical analysis: Total silica, 98.9 percent; calcium oxide, 0.2 percent; magnesium oxide, 0.1 percent; iron and aluminum oxides, 0.3 percent. Petrographic examination: Chalcedonic silica (crystalline aggregates) with an occasional crystal of normal quartz.

DUSTS CAUSING AN INERT REACTION

Aluminum.—Pure aluminum bronzing powder of the finest grade. Chemical analysis: Aluminum oxide, 11.0 percent.

Alundum.—An industrial dust. Chemical analysis: Silica, 4.6 percent; aluminum oxide, 88.4 percent; ferric oxide, 6.9 percent. Petrographic examination: Well crystallized, artificial alumina.

Asbestos (amosite).—An industrial dust. Chemical analysis: Total silica, 48.31 percent; calcium oxide, 0.48 percent; magnesium oxide, 0.66 percent; sodium oxide, 0.72 percent; potassium oxide, 0.02 percent; iron oxide, 44.22 percent; combined oxides, 46.37 percent; total water, 3.62 percent. Petrographic examination showed predominating individual fibers and about 1 or 2 percent of dolomite.

Asbestos (chrysotile).—An industrial dust. Chemical analysis: Total silica, 37.52 percent; calcium oxide, 2.00 percent; magnesium oxide, 36.85 percent; sodium oxide, 0.54 percent; potassium oxide, 0.08 percent; iron oxide, 7.70 percent; combined oxides, 10.30 percent; total water, 12.86 percent. Petrographic examination: Serpentine, in part chrysotile, about 85 percent; dolomite, about 5 percent; magnetite and (or) chromite, about 5 percent; talc, less than 5 percent.

Asbestos (crocidolite).—An industrial dust. Chemical analysis: Total silica, 50.86 percent; calcium oxide, 0.68 percent; potassium oxide, 0.08 percent; iron oxide, 38.33 percent; combined oxides, 39.03 percent; total water, 5.02 percent. Petrographic examination showed fibrous material only.

Anthracite coal.—An industrial dust. Chemical analysis: Ash, 12.6 percent; silica, 6.6 percent. Petrographic examination: Coal about 95 percent; inorganic material, about 5 percent. About 60 percent of the inorganic material is quartz; about 40 percent is calcite, with an occasional crystal of rutile.

Anthracite coal.—An industrial dust. Chemical analysis: Ash, 16.0 percent; silica, 8.6 percent. Petrographic examination: Coal, about 95 percent; inorganic material, about 5 percent. About 95 percent of the inorganic material is quartz; about 5 percent is calcite, siderite, limonite, and rutile.

Bentonite.—An industrial dust. Petrographic examination: Clay, variety montmorillonite, about 97 percent; feldspar, about 2 percent; quartz, none observed.

Bisque ware.—An industrial dust. Ground vitreous pottery bisque ware, fired at a relatively high temperature. Petrographic examination: Quartz, about 30 to 40 percent. The particles are wholly or partially covered by the glass phase. This is absent in the semivitreous bisque ware.

Bituminous coal.—An industrial dust. Chemical analysis: Ash, 8.5 percent; silica, 0.8 percent. Petrographic examination: Mineral content (calcite), about 1 to 2 percent.

Bituminous coal.—An industrial dust. Chemical analysis: Ash, 8.0 percent; silica, 3.5 percent. Petrographic examination: Mineral content (quartz, calcite, clay), between 1 and 3 percent.

Calcium phosphate.—An industrial dust. Chemical analysis: Calcium phosphate, 75.38 percent; calcium carbonate, 3.98 percent; calcium fluoride, 6.80 percent; magnesium carbonate, 0.51 percent; iron oxide, 3.08 percent; aluminum oxide, 3.12 percent; free silica, 2.70 percent; combined silica, 1.87 percent. Petrographic examination: Earthy phosphates (not apatite), about 97 percent; normal and chalcedonic quartz, about 3 percent.

Chromite.—An industrial dust. Chemical analysis: Silica, 7.8 percent; chromic oxide, 25.0 percent. Petrographic examination: Quartz, less than 5 percent.

Diamond dust.—An industrial dust. Pure bortz diamond dust used as abrasive. Petrographic examination confirms identity.

Feldspar.—Chemical analysis: Total silica, 65.9 percent; calcium oxide, 0.81 percent; magnesium oxide, 0.10 percent; aluminum oxide, 19.55 percent; iron oxide, 0.28 percent; potassium oxide, 8.98 percent; sodium oxide, 3.18 percent. Petrographic examination: Feldspar (plagioclase-microcline), about 95 percent; normal quartz, about 5 percent.

Fuller's earth.—An industrial dust. Filtral clay. Chemical analysis: Silica, 55.7 percent; free silica (estimated), 1.0 percent; water, 15.9 percent. Petrographic examination: Clay and residual decomposing feldspar, about 95 percent; quartz, less than 1 percent; gypsum, less than 5 percent.

Fuller's earth.—An industrial dust. Chemical analysis: Silica, 56.4 percent; free silica (estimated), 7.0 percent; water, 8.5 percent. Petrographic examination: Clay and decomposing feldspar, about 90 to 95 percent; quartz, about 5 to 10 percent.

Fuller's earth.—An industrial dust. Chemical analysis: Silica, 57.9 percent; ferric oxide, 2.5 percent; aluminum oxide, 13.1 percent; calcium oxide, 2.9 percent; magnesium oxide, 8.5 percent; water, 6.7 percent. Petrographic examination: Clay-like masses, rounded and irregular, about 70 percent; quartz, about 15 percent; dolomite, about 15 percent.

Fuller's earth.—An industrial dust. Filtral clay. Chemical analysis: Silica, 62.1 percent; free silica (estimated), 3.0 percent; water, 14.9 percent. Petrographic examination: Clay and residual decomposing feldspar, about 98 percent; quartz, 1 to 2 percent; feldspar, an occasional fragment.

Glass wool.—An industrial dust. Finely ground sample of commercial hard glass wool was used. No chemical or petrographic examinations were thought necessary.

Hematite (jewelers' rouge).—An industrial dust. Chemical analysis: Total silica, 1.5 percent; iron oxide, 98.3 percent. Petrographic examination showed no impurities.

Kaolin.—An industrial dust. Petrographic examination: China clay and hydromica predominant; quartz and feldspar, a trace.

Lanthanum sublimate.—An industrial dust. From the burning of white flame electrodes. Chemical analysis: Lanthanum, 40.0 percent. Petrographic examination: Particles too small to identify.

Mica.—An industrial dust. Chemical analysis: Silica, 46.92 percent; magnesium oxide, 0.86 percent; aluminum oxide, 34.95 percent; ferric oxide, 2.65 percent; potassium oxide, 9.54 percent; sodium oxide, 1.02 percent; manganese dioxide, trace. Petrographic examination: Mica, both as plates and fibers, plates predominating, about 98 percent. A very small amount of quartz and feldspar.

Precipitator ash.—An industrial dust. Chemical analysis: Total silica, 49.86 percent; calcium oxide, 6.03 percent; magnesium oxide, 3.01 percent; iron and

aluminum oxides, 40.46 percent. Petrographic examination: Loosely consolidated, white, soft, grit-free ash, about 40 percent; partly rounded aggregates of semifused ash, about 45 percent; smooth fused glass globules, about 10 percent; normal quartz fragments, about 5 percent; unburned coal, less than 1 percent.

Precipitator ash.—An industrial dust. From the boiler plant of a coal company. Chemical analysis: Silica, 48.2 percent; aluminum oxide, 29.3 percent; ferric oxide, 8.5 percent; calcium oxide, 2.1 percent; magnesium oxide, 0.1 percent; organic matter, 8.6 percent. Petrographic examination: Predominantly spherulized glass, some coal fragments, and a trace of quartz.

Precipitator ash.—An industrial dust. Chemical analysis: Silica, 48.3 percent; aluminum oxide, 29.4 percent; ferric oxide, 8.6 percent; calcium oxide, 1.8 percent; magnesium oxide, 0.4 percent; organic matter, 8.7 percent. Petrographic examination: Predominantly semivitrified ash particles, some spheres, coal, and a trace of quartz.

Precipitator ash.—An industrial dust. Chemical analysis: Total silica, 44.7 percent; moisture, 0.1 percent. Petrographic examination: Mostly spherical fused-glass particles, with some semifused masses of crystallites, quartz, possibly calcite and coal fragments.

Precipitator ash.—An industrial dust. Lamphouse deposit from the burning of carbon arcs. Chemical analysis: Rare earth oxides (cerium group), 70.7 percent; ferric oxide, 0.8 percent; magnesium oxide, 0.5 percent; moisture, 9.8 percent; silica, none. Petrographic examination: Inorganic material, rudely rounded, about 5 percent of opaque carbonaceous material and no quartz.

Precipitator ash.—An industrial dust. Condensate from the flue system from burning of carbon arcs. Chemical analysis: Rare earth oxides (cerium group), 59.5 percent; silica, 1.0 percent; ferric oxide, 4.1 percent; magnesium oxide, 0.9 percent; calcium oxide, 0.6 percent; ignition loss, 18.4 percent. Petrographic examination: No quartz or calcite, otherwise similar to preceding sample.

Pyrophyllite.—An industrial dust. No chemical analysis obtained. Petrographic examination: Predominantly pyrophyllite, with a small amount of rutile and some quartz. The quantity of quartz was hard to estimate.

Rock wool.—An industrial dust. A finely ground sample of commercial, insulating rock wool.

Selenium.—An industrial dust. Chemical analysis: Selenium, 98.8 percent; tellurium, 0.01 percent; ash, 1.16 percent.

Selenium.—A chemically prepared sample of highest purity.

Sericite.—A pure mineral dust. Chemical analysis: Total silica, 51.74 percent; calcium oxide, 0.61 percent; magnesium oxide, 1.74 percent; sodium oxide, 3.40 percent; potassium oxide, 4.48 percent; iron oxide, 5.83 percent; combined oxides, 31.82 percent; total water, 6.26 percent. Petrographic examination: Sericite and feldspar residues (fibrous sericite predominates), about 95 percent; quartz, less than 5 percent.

Shale.—An industrial dust. Chemical analysis: Silica, 61.0 percent; aluminum oxide, 12.4 percent; calcium oxide, 4.5 percent; ferric oxide, 5.0 percent; magnesium oxide, 1.3 percent; sodium oxide, 2.3 percent; potassium oxide, 1.5 percent; moisture, 10.3 percent. Petrographic examination: About 35 percent quartz. The majority of the particles appear to be coated with clay.

Silicon carbide.—Pure manufactured silicon carbide. Chemical analysis: Silicon, 67.5 percent. Petrographic examination showed no impurities.

Soapstone.—An industrial dust. Chemical analysis: Total silica, 49.9 percent; calcium oxide, 1.7 percent; magnesium oxide, 26.2 percent. Petrographic examination: Talc, as plates or fibrous splinters, about 65 percent; tremolite, as long fibrous crystals, about 30 percent; dolomite, about 5 percent.

Soapstone.—An industrial dust. Chemical analysis: Total silica, 36.8 percent; calcium oxide, 5.0 percent; magnesium oxide, 22.7 percent. Petrographic examination: Talc, about 55 percent; dolomite, about 30 percent; tremolite, about 15 percent. No quartz observed.

Talc.—An industrial dust. Chemical analysis: Total silica, 49.0 percent; calcium oxide, 8.8 percent; magnesium oxide, 22.6 percent. Petrographic examination: Tremolite, about 60 percent; talc, about 40 percent.

Talc.—An industrial dust. Chemical analysis: Total silica, 56.54 percent; calcium oxide, 6.25 percent; magnesium oxide, 30.74 percent; calcium silicate, 11.00 percent; calcium carbonate, 1.88 percent; iron and aluminum oxides, 1.04 percent; ignition loss, 4.60 percent. Petrographic examination: Talc, mostly fibrous, about 75 percent; tremolite, partly altered to talc, about 25 percent; calcite and (or) dolomite, about 1 percent.

Titanium oxide.—An industrial dust. A finely divided high purity sample.

Sodium silicate.—A laboratory prepared sample containing 1 part sodium oxide to 3.1 parts silica. Higher ratios of sodium oxide kill the animals.

Trap rock.—An industrial dust. Chemical analysis: Silica, 51.7 percent; aluminum oxide, 16.0 percent; ferric oxide, 2.0 percent; ferrous oxide, 9.9 percent; calcium oxide, 10.0 percent; magnesium oxide, 6.2 percent. Petrographic examination: Feldspar, some slightly decomposed, about 45 percent; pyroxene, about 45 percent; magnetite, about 10 percent; biotite, about 1 percent.

Volcanic ash.—An industrial dust. Chemical analysis: Silica, 54.4 percent; aluminum oxide, 14.5 percent; ferric oxide, 3.8 percent; magnesium oxide, 2.6 percent; calcium oxide, 0.7 percent; ash, 78.2 percent. Petrographic examination: Fine volcanic ash partially altered to montmorillonite. No quartz observed.

Volcanic ash.—A specially treated sample. Chemical analysis: Silica, 74.3 percent; mixed oxides, 16.8 percent; ferric oxide, 2.2 percent; calcium oxide, 0.5 percent; magnesium oxide, 2.2 percent. Petrographic examination: Glass only. No quartz or calcite observed.

SUMMARY AND CONCLUSIONS

A definite quantity of dust injected into the peritoneal cavity of a guinea pig produces one of three types of reaction. It disappears, causes proliferation of the peritoneal tissue, or remains as an inert foreign body. These reactions may be used as a basis for the biological classification of industrial dusts, and seem to indicate that some relationship exists between the type of reaction produced in the peritoneal tissue by a dust and the ability of this dust to produce a characteristic type of pneumoconiosis. An absorptive reaction may indicate that a dust is relatively harmless, while a proliferative reaction, characteristic of quartz, may be associated with the ability to produce pulmonary fibrosis. Dusts of the inert group, that is, those that show a tendency to remain in the tissues, should be considered as potentially harmful, but not so dangerous as those causing a proliferative response.

With this biological method of classification, which in a number of instances has been correlated with clinical observations and industrial surveys, it is quite possible to determine the pneumoconiotic potentialities of a dust in a relatively short time, usually 60 days.

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IMMUNOLOGICAL RELATIONSHIPS BETWEEN THE RICKETTSIAE OF AUSTRALIAN AND AMERICAN "Q" FEVER

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INTRODUCTION

The relationship between Australian "Q" fever and a disease caused by an infectious agent isolated from ticks in Montana was first considered by Dyer (*1*) in a description of a human case of a disease probably contracted as a result of a laboratory infection by a member of the staff of the National Institute of Health while on a visit to the Rocky Mountain Laboratory of the United States Public Health Service at Hamilton, Mont. The source of the infection was problematical, although the subject had handled cultures and animals infected with a filter-passing agent which had been isolated at the laboratory by Davis and Cox (*2*) in 1935 from the wood tick *Dermacentor andersoni.* The organism concerned, as described by Cox (*3*), was a minute pleomorphic organism resembling the rickettsiae morphologically and in staining reactions, and in the intracellular and also extracellular occurrence of the organism in the affected tissues of laboratory animals. The infectious agent had been shown to be filterable through both Berkefeld N and W filters. In a later publication Cox (*4*) designated the new rickettsia as *Rickettsia diaporica.*

In experiments to determine the nature of the infectious agent it was found by Dyer at the National Institute of Health that cross-immunity tests between the virus from patient X which had been established in guinea pigs, and typhus, both epidemic and endemic, and Rocky Mountain spotted fever were negative, while five guinea pigs recovered from a strain of "Q" fever previously furnished to the National Institute of Health by Dr. Burnet of Australia were immune to the "X" strain of Dyer.

"Q" fever was described by Derrick (*5*) in 1937 as a new disease occurring in Australia. It affected principally meat workers and dairy farmers. It was distinguished from typhus by the absence of a rash and by a negative Weil-Felix reaction. The outstanding symptoms were fever and headache, and no fatalities occurred. Burnet and Freeman (*6*) described a rickettsial organism present in sections and smears of infected mouse spleens and livers. Emulsions of the organism were agglutinated by the serum of patients having the disease, and sera from convalescent patients protected laboratory animals against the disease. It was assigned the name *Rickettsia burneti* by Derrick (*7*).

Further cross-immunity and protection tests were later reported by Dyer (*8*). In the cross-immunity tests the strains used were: A "Q" fever strain received from Dr. Burnet in the form of two infected mouse spleens and subsequently maintained in mice and guinea pigs; the X strain of Dyer; a strain of endemic typhus and one of epidemic typhus, and two strains of Rocky Mountain spotted fever (the Bitterroot strain and an eastern spotted fever strain isolated from a case of the disease in Maryland). There was complete cross-immunity between the Q and X strains. There was no cross-protection between the X strain and the typhus and spotted fever strains, and none between the "Q" fever and spotted fever strains. There was a suggestion of immunity against the Q strain by the typhus strains, though the reverse was not true. In the protection tests definite protection against the X virus was shown with X serum and "Q" fever serum, while no protection was afforded against either by spotted fever serum.

Burnet and Freeman (*9*) also compared the Australian Q virus and the American X virus. They call attention to the more acute infection of guinea pigs by the American X strain, with shorter incubation period and death of the animals injected with the larger doses, the fibrinous exudate on the spleen, and congestion and partial consolidation of the lungs. Both were found virulent for monkeys, the X strain being found to be considerably more virulent. The higher virulence of the X strain was shown by the development of "foci" on the infected chorioallantoic membrane of chick embryos, whereas these were absent in embryos infected with the Q strain.

A complete cross-immunity in guinea pigs was obtained with the two strains; similar results were also obtained in agglutination tests with human, monkey, bandicoot, rabbit, and mouse sera against emulsions of rickettsiae from spleens of mice infected with both the Q and X strains.

EXPERIMENTAL

In an effort to elucidate further the relationship of the Australian and American diseases agglutination and agglutinin absorption tests were performed. Tests were also made with filtrates to determine whether a precipitin reaction could be demonstrated.

Two human sera were used, several rabbit immune sera against the X and Q strains, guinea pig and mouse sera, and also some specimens of sera received from Dr. Burnet of Australia, including sera from two convalescent patients and from two bandicoots.

The antigens were prepared principally from infected mouse spleens and livers, but yolk sac material of infected chick embryos was also used. The infection was established in mice by the intraperitoneal inoculation of 0.5 cc. of 10-percent suspensions of the spleen or liver of infected guinea pigs. Transfers were made at weekly intervals, using spleens or livers showing the largest number of rickettsiae. Usually two or three passages were necessary before the rickettsiae were present in sufficient numbers to warrant the preparation of the suspensions. It was found that the number of rickettsiae could be increased in a shorter length of time by the inoculation of mice with infected yolk sac material. In general, infection with a larger number of rickettsiae was established in a shorter time in the case of the X strain than with the Q strain; this was to be expected in view of the greater virulence of the X strain.

The infected mouse spleens and livers were ground in mortars with alundum, and 10-percent suspensions were prepared by the addition of buffered salt solution adjusted to pH 7.0. The method of Léon (*10*) was used in the separation of the tissues from the rickettsiae. After a preliminary centrifugation at 1,000 r. p. m. for 5 minutes to precipitate the alundum and larger particles of tissue the supernatant fluid was centrifuged at 3,500 r. p. m. for 1½ hours. The supernatant fluid from this centrifuging was retained for further centrifugation and for filtration. The majority of rickettsiae were precipitated by this method, but a few could be precipitated by added centrifugation at a high speed using the angle centrifuge at a speed of 10,000 r. p. m.

The precipitate was suspended in buffered salt solution at pH 7.0 and 0.5 percent glacial acetic acid was added, drop by drop, to a pH of 5.1 to 5.2 after the temperature had been brought to 35° to 40° C. A light centrifugation for 4 to 5 minutes served to precipitate the proteins, leaving the rickettsiae in the supernatant fluid with very little tissue. The suspensions were again centrifuged at 3,500 r. p. m. for 1½ hours to precipitate the rickettsiae and taken up in appropriate amounts of buffered salt solution and centrifuged lightly to precipitate any large particles. In some cases the reaction was adjusted with N/10 NaOH to pH 7.0 without recentrifugation.

Silica standards were used for adjusting the turbidity of the antigens and tests were carried out with suspensions with turbidities corresponding to 300 and 150 parts per million.

Suspensions were also prepared from infected yolk sac from chick embryos, employing the method described above, but more difficulty was experienced in obtaining pure suspensions with this material. As to the relative virulence of infected mouse spleen and infected yolk sac, the mouse spleen was found at times to be infective in a titer of 1×10^{-11}, which is the same as reported by Cox for yolk sac material.

For the immunizations of rabbits purified suspensions of the rickettsiae killed by the addition of 1/10,000 merthiolate were injected intravenously. Sera of rather good titer were obtained after two intravenous inoculations of 1 cc. of suspenions 2 days apart, followed by another inoculation of 2 cc. in a month, and bleeding in 2 weeks. Other rabbits were given a series of 6 inoculations at weekly intervals, without raising the titer. Another set of rabbits received inoculations with increasing amounts on 2 successive days each week for 8 weeks and in these somewhat higher titers were obtained in the case of the X serum but not of the Q serum (table 1).

AGGLUTINATION TESTS

Simple agglutination tests were performed with human sera and with sera of experimental animals as shown in table 1. The turbidity of the antigen was equivalent to 300 parts per million. Incubation was at 45° C. for 2 hours, after which the tubes were kept overnight at ice-box temperature.

TABLE 1.—*Agglutination of Q and X antigens by animal and human sera*

	Serum dilutions							Control (no serum)
	1:10	1:20	1:40	1:80	1:160	1:320	1:640	
X rabbit serum 1:[1]								
X antigen	4	4	4	4	4	4	2	0
Q antigen	3	3	4	4	4	4	2	0
X rabbit serum 5:[2]								
X antigen	4	4	4	4	4	4	3	
Q antigen	4	4	4	4	4	4	3	
Q rabbit serum 1:[1]								
X antigen	4	4	4	4	4	4	3	
Q antigen	4	4	4	4	4	4	3	
Q rabbit serum 4:[2]								
X antigen	4	4	4	4	4	3	2	
Q antigen	4	4	4	4	4	2	1	
X guinea pig serum 397:[3]								
X antigen	3	3	3	3	3	2	1	
Q antigen	3	3	3	3	3	2	1	
X guinea pig serum 413:[3]								
X antigen	3	3	3	3	3	2	1	
Q antigen	3	3	3	3	3	2	1	
Q guinea pig serum 388:[3]								
X antigen	4	4	4	4	4	3	1	
Q antigen	4	4	4	4	4	3	1	

See footnotes at end of table.

TABLE 1.—*Agglutination of Q and X antigens by animal and human sera*—Contd.

	Serum dilutions							Control (no serum)
	1:10	1:20	1:40	1:80	1:160	1:320	1:640	
X mouse serum 18 (3): [4]								
X antigen	2	2	1	0	0	0	0	
Q antigen	2	1	1	0	0	0	0	
X mouse serum 18 (1–5): [4]								
X antigen	2	2	1	1	0	0	0	
Q antigen	2	2	2	1	0	0	0	
Human serum A: [5]								
X antigen	2	2	1	0	0	0	0	
Q antigen	2	2	1	0	0	0	0	
Human serum B: [5]								
X antigen	2	1	0	0	0	0	0	
Q antigen	2	1	0	0	0	0	0	
Human serum MacArthur: [6]								
X antigen	3	2	2	2	1	0	0	
Q antigen	2	2	2	1	1	0	0	
Bandicoot 119: [7]								
X antigen	2	1	0	0	0	0	0	
Q antigen	2	1	0	0	0	0	0	
Bandicoot 129: [7]								
X antigen	1	2	2	2	2	1	0	
Q antigen	2	2	2	2	1	0	0	
Normal rabbit serum:								
X antigen	0	0	0	0	0	0	0	
Q antigen	0	0	0	0	0	0	0	
Normal horse serum:								
X antigen	0	0	0	0	0	0	0	
Q antigen	0	0	0	0	0	0	0	

[1] Rabbits received 3 intravenous inoculations of rickettsia suspension.
[2] Rabbits received 16 intravenous inoculations of rickettsia suspension.
[3] Guinea pigs received 2 inoculations of 1 cc of X vaccine a week apart and were tested for immunity 16 days later by inoculation of 1 cc of a 10-percent suspension of infected guinea pig spleen
[4] Mice inoculated intraperitoneally with 0.5 cc of a 10-percent suspension of infected mouse spleen.
[5] Five months after onset of illness
[6] Thirteen days after onset of illness (specimen received from Dr Burnet).
[7] Specimen received from Dr Burnet

In another test an anti-X serum and an anti-Q serum were tested against two other lots of X and Q antigens. In this test the antigens were made up to a turbidity of 300 parts per million and to 150 parts per million with the result shown in table 2.

TABLE 2.—*Agglutination of Q and X antigens (of varying turbidity) by anti-Q and anti-X rabbit sera*

	Serum dilutions							Control (no serum)
	1:10	1:20	1:40	1:80	1:160	1:320	1:640	
X serum								
X antigen:								
300 p. p. m.	4	4	4	4	4	3	1	0
150 p. p. m.	4	4	4	4	4	4	1	0
Q antigen:								
300 p. p. m.	4	4	4	4	4	2	1	0
150 p. p. m.	4	4	4	4	4	2	1	0
Q serum								
X antigen:								
300 p. p. m.	4	4	4	3	2	1	0	
150 p. p. m.	4	4	4	4	2	1	0	
Q antigen:								
300 p. p. m.	4	4	4	4	2	1	0	
150 p. p. m.	4	4	4	4	3	1	0	

While the results obtained with the more dilute antigens were clear-cut it would not seem advisable to use as dilute a suspension as this in diagnostic tests with unknown sera.

The results of the simple agglutination test show the close relationship between the two rickettsiae, there being practically no difference in the results obtained, confirming the findings of Burnet and Freeman (*9*).

AGGLUTININ ABSORPTION TESTS

Agglutinin absorption tests were performed with absorbed X and Q serums against both X and Q antigens. The antigens were concentrated by subjecting 15 cc. of each suspension of a turbidity corresponding to 300 parts per million to high speed centrifugation for 30 minutes at approximately 10,000 r. p. m.; the supernatant fluid was removed and the precipitated rickettsiae suspended in 2 cc. of the 1:10 dilution of the corresponding serum. This suspension was placed in a 45° water bath for 2 hours and then centrifuged at a speed of 2,500 r. p. m. for 15 minutes to precipitate the agglutinated rickettsiae. The absorbed sera were tested against both the X and Q antigens of a turbidity of 300 parts per million with the results shown in table 3.

TABLE 3.—*Agglutinin absorption test*

	Serum dilutions						Control (no serum)
	1:20	1:40	1:80	1:160	1:320	1:640	
Absorbed X serum							
X antigen	4	4	4	3	1	0	0
Q antigen	4	4	4	1	0	0	0
Absorbed Q serum:							
X antigen	1	0	0	0	0	0	
Q antigen	0	0	0	0	0	0	

The results against the X and Q antigens were similar with both absorbed sera. In the case of the Q serum the X and Q agglutinins were both absorbed and no agglutination was obtained against either antigen. With the X serum, however, it was necessary to repeat the absorption process twice, after which no agglutination was obtained against either antigen, as shown in table 4.

TABLE 4.—*Agglutinin absorption test with absorbed X serum*

	Serum dilutions					
	1:20	1:40	1:80	1:160	1:320	1:640
X antigen	0	0	0	0	0	0
Q antigen	0	0	0	0	0	0

The results of the agglutinin absorption tests are therefore further evidence of the identity of the two organisms.

TESTS FOR PRECIPITIN REACTIONS

Berkefeld N filtrates.—The supernatant fluids from the centrifugation of the 10 percent suspensions of mouse spleen and livers at 3,500 r. p. m. for 1½ hours were used for precipitin tests. These supernatant fluids were first filtered through Berkefeld N filters. It might be expected that such filtrates, while perfectly clear, would still contain a sufficient number of rickettsiae to cause agglutination. The results obtained are shown in table 5. In these tests an X serum with an agglutination titer of 1:640 and a Q serum with an agglutination titer of 1:320 were used. The concentrations of the serum and antigen were both varied in order to obtain information as to the most suitable dilution to use. A control test was made with normal rabbit serum.

As shown in the protocol of the test, a rather definite precipitate was formed, particularly in the lower dilutions. This was especially true of the X serum when tested against the Berkefeld N filtrates of the X and the Q supernatant fluids. The amount of the precipitate with the Q serum was decidedly less. Though the precipitate was definite and the supernatant fluid clear, the amount of precipitate formed was much smaller than in the agglutination test but somewhat greater in the case of the X serum than might perhaps be expected from residual rickettsiae in the filtrate.

A further test was made with the same filtrates passed through collodion membranes of a pore size of 0.4μ.[1] Burnet and Freeman (*6*) reported that the Q rickettsiae are not completely held back by gradocol membranes of 0.7μ average pore diameter but that small amounts passed through these membranes, as shown by inoculation and immunity tests on guinea pigs. Since the material used in the tests described had been treated with 1/10,000 dilution merthiolate it was necessary to test fresh material with the same pore-size filters to determine whether any of the infectious material passed through the filter. Suspensions of the fresh X material consisting of spleens and livers of infected mice were prepared as before and subjected to filtration through Berkefeld N filters before passing through the collodion membranes of the same pore size as was used for the filtrates under test. Infection occurred in guinea pigs with the Berkefeld filtrate as well as with the collodion filtered material, showing that some of the infectious agent was still present.

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[1] The writer is indebted to Dr. Evelyn B. Tilden for the preparation of the collodion membranes.

TABLE 5.—*Tests for precipitin reactions (Berkefeld N filtrates)*

	Antigen dilutions							Control (no serum)
	1:2	1:4	1:8	1:16	1:32	1:64	1:128	
	X antigen							
X immune rabbit serum								
Serum dilutions:								
1:2	4	4	3	2	2	1	1	0
1:4	3	2	2	2	2	1	0	
1:8	2	2	1	1	1	0	0	
1:16	1	0	0	0	0	0	0	
1:32	0	0	0	0	0	0	0	
	Q antigen							
Serum dilutions:								
1:2	4	4	4	3	2	2	1	0
1:4	3	3	3	3	2	2	1	
1:8	3	3	2	2	1	0	0	
1:16	2	2	2	1	0	0	0	
1:32	2	1	1	0	0	0	0	
	X antigen							
Q immune rabbit serum								
Serum dilutions:								
1:2	2	2	1	1	0	0	0	
1:4	1	1	0	0	0	0	0	
1:8	0	0	0	0	0	0	0	
1:16	0	0	0	0	0	0	0	
1:32	0	0	0	0	0	0	0	
	Q antigen							
Serum dilutions:								
1:2	2	2	2	1	1	0	0	
1:4	1	1	1	0	0	0	0	
1:8	1	0	0	0	0	0	0	
1:16	0	0	0	0	0	0	0	
1:32	0	0	0	0	0	0	0	
	X antigen							
Normal rabbit serum								
Serum dilutions:								
1:2	1	0	0	0	0	0	0	
1:4	1	0	0	0	0	0	0	
1:8	0	0	0	0	0	0	0	
1:16	0	0	0	0	0	0	0	
1:32	0	0	0	0	0	0	0	
	Q antigen							
Serum dilutions:								
1:2	1	0	0	0	0	0	0	
1:4	0	0	0	0	0	0	0	
1:8	0	0	0	0	0	0	0	
1:16	0	0	0	0	0	0	0	
1:32	0	0	0	0	0	0	0	

However, the results obtained in the test with the immune sera were practically negative, as shown in table 6, indicating that under the conditions of the experiment precipitin was not present in the immune sera. It is possible that evidence of the presence of this antigen might be obtained by immunization of rabbits with Berkefeld filtrates of infected material. In any case, however, the results obtained with filtrates serve to establish further the identity of the two rickettsiae.

TABLE 6.—*Tests for precipitin reactions, X immune rabbit serum, and collodion membrane filtrates*

	Antigen dilutions			
	1:2	1:4	1:8	1:16
	X antigen			
Serum dilutions:				
1:2	2	1	0	0
1:4	1	0	0	0
1:8	1	0	0	0
1:16	0	0	0	0
	Q antigen			
Serum dilutions:				
1:2	2	1	0	0
1:4	1	0	0	0
1:8	1	0	0	0
1:16	0	0	0	0

DISCUSSION

The close immunological relationship of the Q and X strains of rickettsiae is indicated by the tests described. This affords added evidence of the identity of the Australian and the American diseases as shown by the cross-immunity and protection tests in laboratory animals described by Dyer (*1*, *8*) and by Burnet and Freeman (*9*).

As has been pointed out by Burnet and Freeman (*9*) and as has also been observed in this laboratory the virulence of the X strain is decidedly greater than that of the Q strain from Australia. This is reflected in the greater ease with which the disease may be established in mice, with correspondingly larger numbers of rickettsiae, as well as in the more pronounced effect in guinea pigs, with a high mortality where large doses of infected mouse spleens or livers are inoculated.

However, it is well known that in a number of other disease entities there may be a variation in the virulence of strains. This is particularly true of Rocky Mountain spotted fever, a much higher mortality in laboratory animals being associated with the Bitterroot type first described in the western part of the country than with certain other strains. Also it is well known that there may be fluctuations in the virulence of a particular disease at different periods; smallpox is a nota-

ble example. It is possible that the virulence of the Australian "Q" fever might differ from the similar disease in this country as a result of the modification of the virus in a host species or in an insect vector. The increased virulence of the X virus for the guinea pig after mouse passage, and the increased virulence for the mouse after chick embryo yolk sac passage afford concrete examples of such a change. In view, therefore, of the practical identity of the results in the serological tests, using both human and experimental animal sera, and of the results obtained in cross-immunity and cross-protection tests in animals, and of the clinical symptoms of the two diseases as pointed out by Dyer, it would appear justifiable to consider the Australian and the American types as one and the same.

SUMMARY

Agglutination and agglutinin absorption tests afford evidence of the identity of the rickettsiae which are the etiological agents of Australian "Q" fever, a disease affecting principally abattoir workers in that country, and a similar disease which occurred as the result of a probable laboratory infection in a member of the staff of the National Institute of Health. Further evidence of the identity of the two organisms has been shown in tests with immune and convalescent sera and Berkefeld N filtrates and ultrafiltrates, though this test was not shown to be that of a true precipitin reaction.

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THE INHIBITING EFFECT OF UREA ON THE MICROBIOLOGICAL ASSAY OF RIBOFLAVIN

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Fraser, Topping, and Isbell (*1*) applied the microbiological method of Snell and Strong (*2*) to the assay of riboflavin in the urine of normal and riboflavin-deficient dogs and rats. They found that the addition of increasing amounts of certain urines of low riboflavin content to the assay tubes produced a progressive diminution in the value of riboflavin found per milliliter of urine. A similar effect has been noted in the assay of human urines of low riboflavin content. Three typical examples of the inhibiting action of human urine are presented in table 1.

Table 1.—*Inhibitory effect of urine on the microbiological assay of riboflavin*

Ml urine added to tube	Micrograms riboflavin found by assay					
	I		II		III	
	Per tube	Per ml.	Per tube	Per ml	Per tube	Per ml.
1	0.07	0.07	0.075	0.075	0.06	0.06
2	.136	.068	.14	0.07	.08	.04
3	.183	.061	.15	0.05	.09	.03
4	.2	.05	.16	0.04	.1	.02
5	.15	.03	.15	0.03		

In an effort to determine the cause or causes of the inhibitory effect of urine on the microbiological assay certain quantitatively important constituents of urine were studied for their inhibitory action on acid production by *Lactobacillus casei.* Definite quantities of the pure compounds were added to tubes containing known amounts of riboflavin. The quantities added were chosen to cover and exceed the range over which the ions comprising the compounds, or the compounds themselves, occur in human urine. NaCl in amounts from 10–250 milligrams, Na_2SO_4 in amounts from 10 to 200 milligrams, KCl in amounts from 10 to 100 milligrams $(NH_4)_2SO_4$ and NH_4Cl in amounts from 10 to 200 milligrams were tested. No diminution in the assay values was noted with any of these salts over the ranges used. Some increase in the assay values was found with all the salts at levels of 80 milligrams or more per tube.

Addition of increasing amounts of urea to the tubes produced a progressive decrease in the assay values from approximately 20 percent at the level of 20 milligrams of urea per tube to 80 to 100 percent at the level of 80 milligrams. Table 2 shows the mean values of riboflavin found by assay in the presence of varying amounts of urea.

TABLE 2.—*Effect of urea on microbiological assay of riboflavin* [1]

Micrograms riboflavin added to tube	Micrograms riboflavin found in presence of urea					
	Milligrams urea added to tube					
	10	20	30	40	60	80
0 05	0 045	0 04	0 04	0 035	0.02	0 00
.075	.06	05	04	.04	.02	.00
.1	.09	08	.07	06	.05	.04
.15	14	13	.11	09	.08	.055
.2	19	165	15	.135	.12	----------
.25	.2	.2	.195	16	----------	----------
.3	.25	.24	21	.175	----------	----------

[1] Each value is an average of 5 to 8 duplicate determinations

From the data given in table 2 the partial regression equation (*3*),

$$X=0.000824Y+1.21Z-\pm 0.017,^{1}$$

was calculated where X represents the micrograms of riboflavin actually present in the tube, Y the milligrams of urea present, and Z the amount of riboflavin apparently present as determined by assay.

Since the equation was derived from data based on the depressing action of a pure solution of urea, it was necessary to determine whether or not urea accounted for all the inhibiting effect of urine. Specimens of urine exhibiting the inhibitory phenomenon were therefore assayed, the amount of urea per milliliter of urine determined by the method of Van Slyke and Cope (*4*),[2] and the values obtained corrected by the use of the regression equation. Known amounts of riboflavin were added to the same urines, assays performed, the values corrected by use of the regression equation, and the percentage recovery of added riboflavin calculated. Table 3 gives the results obtained with 5 typical urines at varied levels of both urea and riboflavin.

One hundred and thirty-six determinations on 24 separate urines gave an average recovery of added riboflavin of 103 percent with a variation of 87 to 118 percent.

In 48 other determinations on 8 urines, known amounts of riboflavin were added to tubes containing 0.5 to 1.0 milliliter of urine. The urines used contained less than 20 milligrams of urea per milliliter of urine. The tubes were assayed, the value of riboflavin per milliliter of urine obtained by difference, and the results obtained compared with those found by using the correction formula. The average values found were identical in all cases.

[1] Standard error of estimate.

[2] The method was slightly modified from the procedure described by Van Slyke and Cope in that the urine was diluted 1-50 or 1-100 instead of to a value calculated from the per minute urine volume and read against the standard of 0.2 milligrams nitrogen, instead of against a blood filtrate.

TABLE 3.—*Recoveries of riboflavin added to urine*

Urine No.	Ml. urine added	Mg. urea added by urine	Micrograms riboflavin added by urine	Micrograms riboflavin added as pure solution	Total riboflavin present in tube	Micrograms riboflavin actually found	Micrograms riboflavin by correction formula	Percent recovery
IV	2.0	15.8	0.06	0.05	0.11	0.09	0.1	90
	2.0	15.8	.06	.1	.16	.15	.16	100
	3.0	23.7	.09	.05	.14	.12	.14	100
	3.0	23.7	.09	.1	.19	.16	.18	95
	4.0	31.6	.12	.05	.17	.13	.15	90
V	2.0	22.4	.04	.1	.14	.13	.14	100
	3.0	34.1	.06	.15	.21	.17	.21	100
	4.0	42.8	.08	.2	.28	.19	.24	87
VI	3.0	36.3	.045	.1	.145	.13	.16	110
	3.0	36.3	.045	.15	.195	.17	.2	98
	3.0	36.3	.045	.2	.245	.208	.235	96
	4.0	48.4	.06	.1	.16	.153	.19	118
VII	3.0	46.5	.135	.05	.185	.157	.195	105
	4.0	71.5	.18	.05	.23	.171	.24	104
VIII	1.0	23	.07	.05	.12	.12	.14	116
	2.0	46	.14	.1	.24	.21	.25	104

DISCUSSION

The excellent recoveries of added riboflavin from urines exhibiting the depressing effect are strong evidence that urea accounts for most, if not all, of the inhibiting action of urine. The results given also prove that the regression equation may be used to obtain the true amount of riboflavin present in a urine exhibiting the depressing phenomenon. The equation need not be applied unless 20 milligrams or more of urea are present in each tube. The regression equation applies best between the levels of 20 to 60 milligrams of urea and in the presence of 0.075 to 0.2 micrograms of riboflavin. If desired, the use of the regression equation may be avoided altogether by adding known quantities of riboflavin to tubes containing 0.5 to 1.0 milliliter of urine and obtaining the values per milliliter of urine by difference.

The stimulation observed with various inorganic salts at levels of 80 milligrams or more should not introduce appreciable error since the amounts required to produce the stimulation do not ordinarily occur in human urine (*5*).

SUMMARY

The inhibiting effect of urines of low riboflavin content on the microbiological assay for riboflavin according to the method of Snell and Strong is demonstrated. Methods for correcting the error due to the inhibiting effect of urea are presented.

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STUDIES ON THE NATURAL HISTORY OF THE VIRUS OF LYMPHOCYTIC CHORIOMENINGITIS IN MICE

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The virus which produces lymphocytic choriomeningitis in man occurs spontaneously in domestic mice (*Mus musculus*), and this rodent infection is connected epidemiologically with human cases (Armstrong). The studies here reported deal with the behavior of the infection in mice.

Spontaneous infection in white mice was studied intensively by Traub, who found that less than 20 percent of the naturally infected animals showed symptoms, although virus was present in practically every organ of the infected mice, as well as in blood, urine, and nasal secretions. Infection spread among mice in two ways—transmission from mother to offspring *in utero*, and from infected to noninfected mice by contact. Mice infected *in utero* or in extreme infancy often retained virus for long periods, but when mice were infected after reaching maturity, virus was recoverable for only a short period. Exposure to the virus produced strong immunity in mice, regardless of whether the animal in question continued to harbor demonstrable virus or not.

The present report is essentially a confirmation of Traub's thorough studies, with some extensions consequent to a somewhat different approach.

METHOD OF STUDY

Except where otherwise mentioned, these studies were made on albino mice of the National Institute of Health "Swiss" stock. Usually mice were kept in glass battery jars; where more than 6 mice were used at a time, large glass cages with screen tops were employed.

Two strains of virus were used, one recently isolated from a human case of choriomeningitis, and the other originating in naturally infected house mice. The two strains behaved similarly.

To determine whether mice under study had contracted infection, the usual method was to test their ability to withstand intracerebral

inoculation with 10–15 M. L. D. of the stock virus; along with each group of mice thus tested, from 5 to 15 fresh mice were inoculated in the same manner, in order to make certain that the virus used in the immunity test actually produced the disease in animals known to be nonimmune. In some cases, mice were sacrificed and active virus was recovered from their viscera.

In this report the term "natural infection" refers to infection contracted *in utero* or by contact with infected mice, as distinguished from infection by inoculation.

NATURE OF THE INFECTION IN MICE

Symptoms in naturally infected mice were extremely mild or entirely inapparent, as shown by the following examples:

1. Seven naturally infected house mice kept in the laboratory for over 5 months showed no evidence of illness, though virus was recovered from their blood and feces during this period. Thirty-six white mice infected by cage contact with the 7 house mice also showed no symptoms.

2. In a series of experiments, 66 fresh white mice were placed in jars with infected white mice for periods of 12 to 28 days; over half became infected through this contact, and there were 4 deaths, presumably incidental, since in another series of tests, where no transmission of infection occurred in mice kept under the same conditions, there were 24 deaths among 117 animals.

Mice from infected litters seemed to mature less rapidly than did normal mice, though this is only an impression, as no weights were kept.

TRANSMISSION AND SURVIVAL OF INFECTION

Transmission in utero.—Infection of mice *in utero* was accomplished in two ways: (1) Pregnant mice inoculated before delivery produced infected litters in many instances; the route of inoculation of the mother was not important. (2) Mice were inoculated intranasally 1 or 2 days after birth; when the females matured and were bred, they tended to produce infected offspring.

Mice infected *in utero* transmitted the virus to their descendants in many instances, as is shown in table 1. That infection of these offspring was not due to chance spread of virus in the laboratory appears later, in table 3, where it is shown that litters born to mice inoculated after reaching adulthood, but before becoming pregnant, failed to become infected.

Since infected mice were usually detected by immunity tests, it is necessary to show that it was actual infection and not merely immunity that was passed on from mothers to offspring. This is indicated by the following observations:

1. One mouse from each of 4 litters, removed two or three generations from inoculated ancestors, was killed and found to contain virus by inoculating an emulsion of its spleen and liver into fresh mice; the litter mates of these infected mice were at the same time found to be immune by the usual test. On the other hand, one mouse from each of two other litters yielded no virus, and the litter mates of these mice did not survive the immunity test.

2. Five mice infected *in utero* were killed from 107 to 216 days after birth and found still to harbor living virus.[1]

3. Virus was recovered from a pooled sample of feces from 5 mice infected *in utero;* the mice were 107 days old at the time of this test.

4. Twenty-one mice infected *in utero* transmitted infection to fresh mice kept in jars with them for periods of 12 to 28 days.

TABLE 1.—*Transmission of virus to descendants of mice inoculated during pregnancy or during infancy*

Descendants of inoculated female mice	24 mice inoculated 1 to 11 days before delivering young				21 mice inoculated intranasally within 1 to 2 days of birth			
	Total born		Number infected		Total born		Number infected	
	Litters	Mice	Litters	Mice	Litters	Mice	Litters	Mice
First generation	14	64	10	34	17	65	15	57
Second generation	23	116	10	56	9	50	9	50
Third generation	14	69	12	57	(1)	(1)	(1)	(1)

1 Studies on the group infected by inoculation in infancy were not carried beyond two generations of offspring.

The prolonged survival of the virus in mice infected *in utero* is indicated by these observations. Another example of this survival appears in the ability of females to transmit infection to successive litters in the same generation. This is shown in table 2.

TABLE 2.—*Transmission of infection by mice to multiple litters*

Offspring of 8 mice infected *in utero* or early infancy, which gave birth to more than 1 litter each	Number mice in litters	Number mice infected
First litters	32	32
Second litters	46	[1] 33
Third litter	2	2

1 Offspring of 6 mice. Two mice produced infected first litters but failed to infect their second litters.

In contrast to mice infected *in utero* or early infancy, animals inoculated after reaching maturity (i. e., 3 weeks or older) did not transmit infection to their offspring, provided they were not pregnant at the time of inoculation or did not become so shortly thereafter. This appears in table 3.

[1] These mice had been inoculated with the stock virus when they were 1 month old, in order to test their immunity. Experience with this strain of virus has indicated that in the majority of instances it is not recoverable from inoculated mice for longer than a few weeks after injection, and therefore could not have been responsible for the results obtained here.

TABLE 3.—*Failure of mice inoculated after reaching maturity to transmit infection to their offspring*

Mice inoculated during adult life and subsequently producing offspring	Offspring			
	Number born		Number infected	
	Litters	Mice	Litters	Mice
33 females inoculated 34 to 149 days before giving birth to young	26	142	None	None
14 males inoculated 28 to 95 days before siring offspring	8	39	None	None

One female, not included in table 3, produced infected offspring 31 days after being inoculated; apparently enough virus survived to infect the offspring conceived shortly after inoculation.

In further contrast to mice infected *in utero* or early infancy, adult mice inoculated while pregnant did not transmit the virus to offspring conceived after the birth of those carried at the time of inoculation. Three mice inoculated during pregnancy and giving birth to infected litters subsequently produced additional offspring to the total of 16, none of which were infected.

Most of the second and third generations of infected mice were obtained by breeding infected males with infected females. In three instances, however, naturally infected females produced litters sired by uninfected males. Two of these litters were infected, indicating that virus passed from infected mothers to offspring regardless of the status of the male parents. On the other hand, when infected males were bred to uninfected females, the offspring were not infected, as indicated by the following summary: 11 infected males were bred with 19 uninfected females; 13 litters resulted, comprising 74 mice; 12 of these litters, comprising 69 mice, were uninfected. One litter of 5 mice was immune when tested, and it is probable that these particular mice acquired infection through contact with the infected father, a circumstance generally prevented by removing the male before the young were delivered. A second uninfected female in the same jar at the time this litter was born later produced an uninfected litter, contact between this litter and the father having been avoided.

Transmission by contact.—Mice infected *in utero* or in infancy transmitted infection to others placed in contact with them. This is shown in table 4.

In one of the tests in which white mice were infected through contact with the gray mice, virus was recovered from a contact as early as the sixth day.

In addition to the examples of contact infection given above, there were four litters inoculated intranasally on the first or second day after birth and allowed to remain with the mothers for a month. At the end of this period all the mothers were immune.

TABLE 4.—*Transmission of virus by mice infected in utero or infancy to mice placed in contact with them*

Infected mice with which fresh mice were in contact	Length of contact (days)	Fresh mice	
		Number used	Number infected
7 gray house mice infected in nature	6 to 28	[1] 47	36
32 white mice infected *in utero* and early infancy [3]	12 to 28	[2] 66	35

[1] 6 different tests.
[2] 18 different tests.
[3] These mice were all at least 1 month old when used for these tests.

Mice which became infected after reaching their maturity (i. e., 3 weeks or older) rarely transmitted the virus to contacts, in contrast to mice infected *in utero* or in infancy. This was true regardless of whether the adult mice had been infected by inoculation or by having been themselves in contact with mice capable of transmitting infection. The experiments establishing these statements are summarized in table 5.

TABLE 5.—*Failure of mice infected after reaching maturity (i. e., 3 weeks or older) to transmit virus to fresh mice placed in contact with them*

Mice infected by inoculation or by contact after reaching maturity, and then placed in contact with fresh mice	Length of contact (days)	Fresh mice	
		Number used	Number infected
25 white mice infected through contact with naturally infected mice.	16 to 31	[1] 50	2
72 white mice infected by inoculation (various routes)	8 to 37	[2] 95	1
Total		145	3

[1] 10 different tests.
[2] 23 different tests.

The mode of spread of contact infection among mice was investigated by the following experiments:

1. *Sex.*—Semen taken from infected males and instilled into the vaginae of 12 females infected 9 of them; the females eventually produced 8 litters, comprising 51 mice, none of which were infected. Experiments on contact infection indicated that sexual contact was not necessary for transmission of the virus: 6 females infected 8 out of 17 males; 5 males infected 9 out of 16 females; 2 males infected 3 out of 5 males; 4 females infected 9 out of 16 females.

2. *Feces and urine.*—Traub found the virus in urine of infected mice but was unable to infect mice by placing them in cages heavily contaminated with such urine. During the present studies, virus was recovered from two pooled samples of feces collected, respectively, from 3 and 5 infected mice. The experiments summarized below,

however, indicate that feces and urine were not essential for transmission of the infection among mice:

(a) Ten fresh mice were put into a glass cage which had been inhabited for 22 days by infected mice, and which had not been cleaned in any way. After 16 days in this cage the fresh mice were found to be nonimmune; the infected mice had transmitted infection to 18 fresh mice during their occupancy of this cage.

(b) Each of five jars was divided into an upper and a lower compartment by a horizontal screen. In each of three jars an infected mouse was kept in the bottom compartment and two fresh mice in the top; in the other two jars the position of the mice was reversed. Mice in the lower compartment were exposed to urine and feces falling through the screen from those above, but mice in the upper section were not exposed to these excreta. The test lasted a month, and the result was that one fresh mouse in each jar was found to have become infected. In other words, mice not exposed to feces and urine were infected as readily as those so exposed.

It must be concluded from these experiments that neither sexual contact nor feces and urine were essential in the spread of contact infection among mice. Since ectoparasites were not present in the cages where such spread occurred, it appears that nasal discharges or saliva were the likely means of disseminating the virus. Quite possibly both are important; Traub found abundant virus in nasal washings, and nose-to-nose contact among mice is common. In some instances, however, fighting results in infliction of numerous wounds, and during these studies virus was recovered from 2 badly bitten mice.

Survival of the virus.—The observations already discussed suggest that virus survived for long periods in mice infected *in utero* or in early infancy, whereas in mice infected after reaching maturity active infection tended to be demonstrable only for a short while. This contrast between mice infected at different stages of life is further emphasized by the following experiment:

Five fresh mice were placed in a cage with 3 infected mice, 1 of which had been infected *in utero* and 2 on the day of birth. After 23 days in the cage, all the mice were given the usual immunity test, which they survived; 35 days after this test all were killed and tested for virus. The mouse infected *in utero*, which was 216 days old when killed, yielded active virus, as did one of those infected on the day of birth, 185 days before; the other mouse infected on the day of birth, 148 days previously, yielded no demonstrably active virus, nor did any of the 5 mice which had developed an immunity following contact with the infected animals.[3]

[3] Mice inoculated intracerebrally with spleen emulsions of these five mice failed to develop any signs of choriomeningitis, the mice inoculated with such an emulsionf rom one of these five mice later survived an immunity test with the stock virus, indicating that in this one instance virus may have been present in very small amount or in a condition not sufficiently active to produce detectable disease.

It appears that there was a basic difference between the nature of infection established *in utero* or in very young mice and that introduced into mice already mature, and this difference was indicated by the ability of mice infected *in utero* or in infancy to retain the virus and to transmit infection to offspring and contacts, while the others did not.

SUMMARY

Infection of white mice by the virus of choriomeningitis, when acquired *in utero* or by contact, was generally of an inapparent type.

Mice infected *in utero* or early infancy tended to retain active virus for long periods, probably in some instances for life, and to transmit infection to offspring and contacts. Infection passed from infected mothers to offspring whether the fathers were infected or not, but it did not pass from infected fathers to offspring through uninfected mothers.

Mice infected after reaching maturity did not transmit infection to their offspring, except for females pregnant at time of inoculation, and rarely infected contacts. Active virus was not generally demonstrable in such mice except for short periods after exposure or inoculation.

Transmission of infection from naturally infected mice to fresh contacts occurred when exposure through sexual contact, urine, and feces were eliminated, infection in such instances apparently being conveyed by nasal secretions or saliva.

These observations are in agreement, in the essential points, with those previously reported by Traub.

The behavior of this virus in mice is particularly interesting because of two underlying facts: First, the continuous propagation of an infection that is inapparent, or nearly so; and second, the basic difference in response to infection shown by very young mice as compared to the response of mice subjected to infection after reaching maturity.

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A NOTE ON MODIFIED RADIO PRATIQUE IN GUAYAQUIL

By ROBERT OLESEN, *Medical Director, United States Public Health Service*

Radio pratique was inaugurated at the port of New York on February 1, 1937, and has been in successful operation since that time.[1] This procedure is also practiced in Boston, New Orleans, New York, Los Angeles, and San Francisco.

In United States ports only passenger vessels with accredited ship's doctors are eligible for radio pratique. However, in Canada cargo as well as passenger vessels are accorded this privilege even though a physician is not a member of the crew. Radio pratique, as administered at William Head quarantine station, Victoria, British Columbia, has been described by Dr. H. B. Jeffs.[2] Experience with radio pratique for freighters has been entirely satisfactory in Canada.

Radio pratique principles have now been extended to other countries, Ecuador being the latest to make use of this practical modification of maritime quarantine. According to recent information the following procedure is in effect for southbound vessels arriving in Guayaquil:

1. Within 24 hours prior to arrival the ship's doctor shall send a radio message to the quarantine officer advising that there is no illness of any kind on board and that all passengers have been vaccinated against smallpox.
2. Upon arrival in port the vessel will be boarded by the quarantine officer who will require a copy of the radiogram signed by the master and the ship's doctor.
3. The ship's doctor must also present a vaccination certificate for each person who lands in Guayaquil.
4. Having obtained these documents the quarantine officer may allow the other port authorities to board the vessel without further formality.
5. Pratique will be withheld and customary inspection made under the following circumstances:

[1] [illegible], C. V.: Pratique by Wireless in Lieu of Quarantine Inspection for Passenger Vessels. Pub. Health Rep., 52: 507 (Apr. 23, 1937).

[2] Bulletin of the International Office of Public Health, 31: 1581 (September 1939).

(*a*) If the radiogram is not confirmed.

(*b*) If the vaccination certificates are not in order.

(*c*) If illness has occurred after the radiogram was sent.

Cargo vessels are not included in this procedure.

Steamship companies estimate that a considerable saving of time will be effected at Guayaquil by this utilization of radio messages prior to the arrival of vessels in port.

Comment.—It has been found, as the result of actual practice and careful observation, that the public health has not been imperiled by radio pratique and that this modification of maritime quarantine is helpful in expediting commercial activities. With the leadership already provided in several countries it may be expected that the measure will be adopted even more widely.

NOTIFIABLE DISEASES IN THE UNITED STATES, 1939

Morbidity and Mortality Summaries for Certain Important Communicable Diseases

The United States Public Health Service has recently issued a tabular morbidity and mortality compilation, by States and by months, for the notifiable diseases as reported by the State health officers in 1939.[1] A summary of this compilation is presented here, together with case and death rates, case fatality rates, and, in some instances, the estimated expectancy based on figures for recent preceding years.

For certain diseases, some States do not report cases, or the case reports are manifestly incomplete. In such instances groups of States with the most satisfactory morbidity reports are treated separately in order to arrive at more nearly accurate case and case fatality rates, while the totals for the larger group of States include the deaths as cases in States which reported fewer cases than deaths. Case fatality rates are not computed, however, on such totals.

The mortality figures may be considered as approximately correct, although they will not agree in all instances with the final figures of the Bureau of the Census.

The estimated expectancy, given for some of the diseases, represents an attempt to ascertain from the experience of recent years the number of cases of a disease that might normally have been expected in 1939.

In comparing the numbers of cases reported in 1939 with the estimated expectancy, or with figures for preceding years, it should be borne in mind that there has been a gradual improvement in the

[1] The Notifiable Diseases—Prevalence in States, 1939. Supplement No. 163 to the Public Health Reports. Government Printing Office, Washington, 1941.

reporting of notifiable diseases and that the population has increased. A large increase, however, especially in the case rate, is likely to represent an actual increase in the prevalence of the disease. The populations given for groups of States, used in computing case and death rates, were estimated as of July 1, 1939, by the Public Health Service, and are based on the populations for 1930 and preliminary figures for 1940 populations as published by the Bureau of the Census.

CHICKENPOX (38e) *

47 States: [1]	
Cases reported, 1939 (population 130,275,000)	258, 486
Estimated expectancy based on years 1932-38	261, 519
Cases per 1,000 inhabitants, 1939	1. 984
Cases per 1,000 inhabitants, estimated expectancy	2. 059
Deaths registered, 1939	110
Deaths per 1,000 inhabitants, 1939	0. 001
Cases reported for each death registered, 1939	2, 350
48 States: [1]	
Cases reported, 1939 (population 130,763,000)	258, 746
Cases per 1,000 inhabitants, 1939	1. 979

DIPHTHERIA (10)

47 States: [1]	
Cases reported, 1939 (population 130,275,000)	24, 045
Estimated expectancy based on years 1932-38	38, 269
Cases per 1,000 inhabitants, 1939	0. 185
Cases per 1,000 inhabitants, estimated expectancy	0 301
Deaths registered, 1939	2, 022
Deaths per 1,000 inhabitants, 1939	0. 016
Cases reported for each death registered, 1939	12
48 States: [1]	
Cases reported, 1939 (population 130,763,000)	24, 053
Cases per 1,000 inhabitants, 1939	0. 184

DYSENTERY (AMOEBIC) (27b)

33 States: [1]	
Cases reported, 1939 (population 107,355,000)	2, 981
Cases per 1,000 inhabitants, 1939	0. 028
Deaths registered, 1939	220
Deaths per 1,000 inhabitants, 1939	0. 002
Cases reported for each death registered, 1939	14
39 States: [1]	
Cases reported, 1939 (population 126,553,000)	[2] 3, 039
Deaths registered, 1939	278
Deaths per 1,000 inhabitants, 1939	0. 002
47 States: [1]	
Deaths registered, 1939 (population 130,275,000)	282
Deaths per 1,000 inhabitants, 1939	0. 002

DYSENTERY (BACILLARY) (27a)

31 States:	
Cases reported, 1939 (population 101,476,000)	21, 137
Cases per 1,000 inhabitants, 1939	0. 208
Deaths registered, 1939	831
Deaths per 1,000 inhabitants, 1939	0 008
Cases reported for each death registered, 1939	25
41 States: [1]	
Cases reported, 1939 (population 126,719,000)	[2] 21, 327
Deaths registered, 1939	1, 021
Deaths per 1,000 inhabitants, 1939	0. 008
46 States: [1]	
Deaths registered, 1939 (population 128,382,000)	1, 046
Deaths per 1,000 inhabitants, 1939	0. 008

ENCEPHALITIS, EPIDEMIC OR LETHARGIC (37)

29 States: [1]	
Cases reported, 1939 (population 81,496,000)	787
Cases per 1,000 inhabitants, 1939	0. 010
Deaths registered, 1939	363
Deaths per 1,000 inhabitants, 1939	0. 004
Cases reported for each death registered, 1939	2. 168
47 States: [1]	
Cases reported, 1939 (population 130,275,000)	[2] 1, 069
Deaths registered, 1939	645
Deaths per 1,000 inhabitants, 1939	0. 005

*Figures in parentheses in the subheadings are disease title numbers from the International List of Causes of Death, 1938.

[1] The District of Columbia is also included but not counted as a State.

[2] Includes the number of deaths used as cases when no cases are reported, or when the reported number of cases is less than the number of deaths

GONORRHEA (25)

48 States:[1]	
Cases reported, 1939 (population 130,763,000)	178,343
Cases per 1,000 inhabitants, 1939	1.364

INFLUENZA (33)

42 States:[1]	
Cases reported, 1939 (population 101,802,000)	275,503
Cases per 1,000 inhabitants, 1939	2.706
Deaths registered, 1939	19,724
Deaths per 1,000 inhabitants, 1939	0.194
Cases reported for each death registered, 1939	13.968
47 States:[1]	
Cases reported, 1939 (population 130,275,000)	[2] 277,613
Deaths registered, 1939	21,834
Deaths per 1,000 inhabitants, 1939	0.168
48 States:[1]	
Cases reported, 1939	[2] 277,616

MALARIA (28)

40 States:	
Cases reported, 1939 (population 125,977,000)	82,654
Cases per 1,000 inhabitants, 1939	0.656
Deaths registered, 1939	1,749
Deaths per 1,000 inhabitants, 1939	0.014
Cases reported for each death registered, 1939	47
40 States:[1]	
Cases reported, 1939 (population 126,627,000)	[2] 82,655
Deaths registered, 1939	1,750
Deaths per 1,000 inhabitants, 1939	0.014
47 States:[1]	
Deaths registered, 1939 (population 130,275,000)	1,750
Deaths per 1,000 inhabitants, 1939	0.013

MEASLES (35)

47 States:[1]	
Cases reported, 1939 (population 130,275,000)	403,037
Cases per 1,000 inhabitants, 1939	3.094
Deaths registered, 1939	1,171
Deaths per 1,000 inhabitants, 1939	0.009
Cases reported for each death registered, 1939	344
48 States:[1]	
Cases reported, 1939 (population 130,763,000)	403,317
Cases per 1,000 inhabitants, 1939	3.084

MENINGITIS, MENINGOCOCCUS (6)

45 States:[1]	
Cases reported, 1939 (population 128,024,000)	1,970
Estimated expectancy based on years 1932-38	3,611
Cases per 1,000 inhabitants, 1939	0.015
Cases per 1,000 inhabitants, estimated expectancy	0.029
Deaths registered, 1939	694
Deaths per 1,000 inhabitants, 1939	0.005
Cases reported for each death registered, 1939	2.839
47 States:[1]	
Cases reported, 1939 (population 130,275,000)	[2] 1,991
Deaths registered, 1939	715
Deaths per 1,000 inhabitants, 1939	0.005
48 States:[1]	
Cases reported, 1939	[2] 1,993

MUMPS (44C)

40 States:	
Cases reported, 1939 (population 98,306,000)	129,714
Estimated expectancy based on years 1932-38	115,385
Cases per 1,000 inhabitants, 1939	1.319
Cases per 1,000 inhabitants, estimated expectancy	1.198
Deaths registered, 1939	70
Deaths per 1,000 inhabitants, 1939	0.001
Cases reported for each death registered, 1939	1,853
44 States:	
Cases reported, 1939 (population 109,348,000)	[2] 129,731
Deaths registered, 1939	87
Deaths per 1,000 inhabitants, 1939	0.001
47 States:	
Cases reported, 1939	[2] 131,826

[1] The District of Columbia is also included but not counted as a State.
[2] Includes the number of deaths used as cases when no cases are reported or when the reported number of cases is less than the number of deaths.

PELLAGRA (69)

18 States:	
Cases reported, 1939 (population 48,811,000)	10,200
Cases per 1,000 inhabitants, 1939	0.209
Deaths registered, 1939	1,925
Deaths per 1,000 inhabitants, 1939	0.039
Cases reported for each death registered, 1939	5.299
39 States:[1]	
Cases reported, 1939 (population 123,216,000)	[2] 10,717
Deaths registered, 1939	2,442
Deaths per 1,000 inhabitants, 1939	0.020
47 States:[1]	
Deaths registered, 1939 (population 130,275,000)	2,442
Deaths per 1,000 inhabitants, 1939	0.019

PNEUMONIA (ALL FORMS) (107–109)

29 States:[1]	
Cases reported, 1939 (population 89,689,000)	121,257
Cases per 1,000 inhabitants, 1939	1.352
Deaths registered, 1939	52,554
Deaths per 1,000 inhabitants, 1939	0.586
Cases reported for each death registered, 1939	2.307
47 States:[1]	
Deaths registered, 1939 (population 130,275,000)	77,602
Deaths per 1,000 inhabitants, 1939	0.596
48 States:[1]	
Cases reported, 1939	[2, 3] 147,658

POLIOMYELITIS (36)

47 States:[1]	
Cases reported, 1939 (population 130,275,000)	7,339
Estimated expectancy based on years 1932–38	3,726
Cases per 1,000 inhabitants, 1939	0.056
Cases per 1,000 inhabitants, estimated expectancy	0.029
Deaths registered, 1939	756
Deaths per 1,000 inhabitants, 1939	0.006
Cases reported for each death registered, 1939	9.708
48 States:[1]	
Cases reported, 1939 (population 130,763,000)	7,343
Cases per 1,000 inhabitants, 1939	0.056

SCARLET FEVER (8)

47 States:[1]	
Cases reported, 1939 (population 130,275,000)	162,735
Estimated expectancy based on years 1932–38	207,103
Cases per 1,000 inhabitants, 1939	1.249
Cases per 1,000 inhabitants, estimated expectancy	1.630
Deaths registered, 1939	855
Deaths per 1,000 inhabitants, 1939	0.007
Cases reported for each death registered, 1939	190
48 States:[1]	
Cases reported, 1939 (population 130,763,000)	162,897
Cases per 1,000 inhabitants, 1939	1.246

SEPTIC SORE THROAT (115b)

33 States:	
Cases reported, 1939 (population 85,360,000)	8,538
Cases per 1,000 inhabitants, 1939	0.100
Deaths registered, 1939	1,262
Deaths per 1,000 inhabitants, 1939	0.015
Cases reported for each death registered, 1939	6.765
43 States:[1]	
Cases reported, 1939 (population 119,201,000)	[2] 9,227
Deaths registered, 1939	1,951
Deaths per 1,000 inhabitants, 1939	0.016
46 States:[1]	
Cases reported, 1939	[2] 10,758

SMALLPOX (34)

47 States:[1]	
Cases reported, 1939 (population 130,275,000)	9,877
Estimated expectancy, based on years 1932–38	7,093
Cases per 1,000 inhabitants, 1939	0.076
Cases per 1,000 inhabitants, estimated expectancy	0.056
Deaths registered, 1939	39
Deaths per 1,000 inhabitants, 1939	0.0002
Cases reported for each death registered, 1939	253
48 States:[1]	
Cases reported, 1939 (population 130,763,000)	9,877
Cases per 1,000 inhabitants, 1939	0.076

[1] The District of Columbia is also included but not counted as a State.
[2] Includes the number of deaths used as cases when no cases are reported or when the reported number of cases is less than the number of deaths.
[3] Includes 7,484 cases of lobar pneumonia only.

SYPHILIS (30)

48 States: [1]	
Cases reported, 1939 (population 130,763,000)	485,065
Cases per 1,000 inhabitants, 1939	3.709

TUBERCULOSIS (ALL FORMS) (13–22)

37 States: [1]	
Cases reported, 1939 (population 103,700,000)	92,292
Cases per 1,000 inhabitants, 1939	0.890
Deaths registered, 1939	47,828
Deaths per 1,000 inhabitants, 1939	0.461
Cases reported for each death registered, 1939	1.930
45 States: [1]	
Cases reported, 1939 (population 125,291,000)	[2] 102,776
Deaths registered, 1939	58,312
Deaths per 1,000 inhabitants, 1939	0.465
47 States: [1]	
Deaths registered, 1939 (populaton 130,275,000)	61,319
Deaths per 1,000 inhabitants, 1939	0.471

TUBERCULOSIS (RESPIRATORY SYSTEM) (13)

21 States: [1]	
Cases reported, 1939 (population 63,639,000)	52,885
Cases per 1,000 inhabitants, 1939	0.831
Deaths registered, 1939	27,375
Deaths per 1,000 inhabitants, 1939	0.430
Cases reported for each death registered, 1939	1.932
46 States: [1]	
Cases reported, 1939 (population 129,632,000)	[2] 81,451
Deaths registered, 1939	55,941
Deaths per 1,000 inhabitants, 1939	0.432
48 States: [1]	
Cases reported, 1939	[2] 81,996

TYPHOID FEVER (1) AND PARATYPHOID FEVER (2)

47 States: [1]	
Cases reported, 1939 (population 130,275,000)	13,055
Estimated expectancy based on years 1932–38	18,679
Cases per 1,000 inhabitants, 1939	0.100
Cases per 1,000 inhabitants, estimated expectancy	0.147
Deaths registered, 1939	1,997
Deaths per 1,000 inhabitants, 1939	0.015
Cases reported for each death registered, 1939	6.537
48 States: [1]	
Cases reported, 1939 (population 130,763,000)	13,069
Cases per 1,000 inhabitants, 1939	0.100

WHOOPING COUGH (9)

47 States: [1]	
Cases reported, 1939 (population 130,275,000)	183,016
Estimated expectancy based on years 1932–38	199,896
Cases per 1,000 inhabitants, 1939	1.405
Cases per 1,000 inhabitants, estimated expectancy	1.574
Deaths registered, 1939	3,008
Deaths per 1,000 inhabitants, 1939	0.023
Cases reported for each death registered, 1939	61
48 States: [1]	
Cases reported, 1939 (population 130,763,000)	183,188
Cases per 1,000 inhabitants, 1939	1.401

[1] The District of Columbia is also included but not counted as a State.

[2] Includes the number of deaths used as cases when no cases are reported, or when the reported number of cases is less than the number of deaths.

Cases reported, 1939, by months

Disease	Number of States [1]	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anthrax in man (7)	12	6	4	4	6	4	2	4	9	3	2	7	6	57
Chickenpox (38e)	48	41,096	35,932	35,890	27,711	24,940	15,087	5,020	2,237	2,470	9,424	24,021	34,877	[2] 258,746
Dengue (38f)	8	7	9	15	12	2	5	10	30	31	9	8	6	144
Diphtheria (10)	48	2,476	1,961	1,781	1,489	1,226	961	1,051	1,401	2,330	3,221	3,396	2,748	[2] 24,053
Dysentery (amoebic) (27b)	39	197	210	199	277	246	376	307	331	266	261	207	162	[3] 3,039
Dysentery (bacillary) (27a)	41	510	472	508	775	2,236	4,641	4,445	2,233	2,327	1,230	1,173	771	[2] 21,327
Dysentery (unspecified) (27c)	5	38	36	50	46	196	185	103	191	113	106	69	50	1,183
Encephalitis, epidemic or lethargic (37)	47	90	58	75	60	66	49	86	158	129	112	99	80	[2, 3] 1,069
Influenza (33)	48	20,723	39,090	94,136	45,609	11,134	3,615	2,433	2,625	3,541	6,046	11,167	37,206	[2, 3] 277,616
Malaria (28)	40	1,948	1,613	2,187	3,764	5,613	9,377	14,079	14,103	14,000	8,847	4,841	2,283	[3] 82,655
Measles (35)	48	42,794	61,082	76,170	68,003	72,371	39,381	12,595	3,275	2,128	4,289	8,322	12,896	[2] 403,317
Meningitis, meningococcus (6)	48	234	227	229	192	171	129	127	100	116	138	146	140	[2, 3] 1,993
Mumps (44c)	47	16,377	18,567	24,267	19,226	17,250	9,455	4,066	2,550	2,326	3,468	6,329	7,945	[3] 131,826
Pellagra (69)	39	623	670	745	1,060	1,240	1,382	1,329	1,035	766	718	574	575	[3] 10,717
Pneumonia (all forms) (107-109)	48	21,227	22,206	23,271	17,581	11,690	6,336	4,454	3,996	4,375	6,257	9,536	15,437	[2, 3, 4] 147,658
Poliomyelitis (36)	48	74	71	45	97	184	278	643	1,602	2,018	1,366	669	295	[2] 7,343
Rabies in animals	29	594	520	539	449	452	400	265	294	252	228	221	204	[5] 4,418
Rabies in man (deaths) (38b)	47	6	2	3	2	1	8	6	3	4	2	4	2	[2] 44
Rocky Mountain spotted fever (39c)	32	3	2	4	41	103	134	106	109	36	13	5	4	[3] 560
Scarlet fever (8)	48	22,433	22,715	22,848	18,669	15,937	7,655	3,693	3,382	5,104	9,538	14,139	16,782	[2] 162,897
Septic sore throat (115b)	46	1,067	1,159	1,290	1,067	1,138	794	543	565	613	575	946	1,001	[3] 10,758
Smallpox (34)	48	1,658	1,677	1,470	1,565	1,321	845	368	115	112	113	234	409	9,877
Tuberculosis (all forms) (13-22)	45	7,902	7,387	9,672	9,135	9,347	9,520	9,206	9,168	8,188	8,343	7,515	7,376	[2, 3] 102,776
Tuberculosis (respiratory system) (13)	48	6,537	5,962	8,132	7,272	7,685	7,362	6,861	6,913	6,457	6,606	6,182	6,011	[2, 3] 81,996
Tularaemia (26a)	41	304	118	102	79	79	78	76	91	95	85	354	830	2,291
Typhoid and paratyphoid fever (1-2)	48	449	470	523	490	640	1,089	2,088	2,260	2,220	1,217	835	787	[2] 13,069
Typhus fever (39a) (39b)	21	188	120	85	109	175	188	359	484	432	317	275	266	[3] 2,998
Undulant fever (5)	47	285	224	235	277	293	347	358	402	348	219	270	293	3,501
Venereal diseases:														
Gonorrhea (25)	48	13,414	13,331	14,598	14,327	14,877	15,229	15,820	17,549	16,356	15,695	14,323	12,824	178,343
Syphilis (30)	48	37,831	42,622	43,102	43,386	45,363	40,275	40,702	41,551	40,001	38,073	38,902	33,257	485,065
Whooping cough (9)	48	19,741	17,771	19,114	16,333	17,512	17,154	17,815	13,592	10,805	9,869	11,927	11,550	[2] 183,188

[1] The District of Columbia is also included but not counted as a State.

[2] The following numbers of cases of certain diseases are not distributed by months but are included in the totals of the above table: Chickenpox, 41; diphtheria, 12; dysentery (bacillary), 6; encephalitis, epidemic or lethargic, 7; influenza, 291; measles, 11; meningitis, meningococcus, 44; pneumonia (all forms), 1,292; poliomyelitis, 1; rabies in man, 1; scarlet fever, 2; tuberculosis (all forms), 17; tuberculosis (respiratory system), 16; typhoid fever, 1; whooping cough, 5.

[3] Includes the number of deaths used as cases when no cases are reported, or when the reported number of cases is less than the number of deaths.

[4] Includes 4,460 cases of lobar pneumonia only in Massachusetts, and 3,024 cases of lobar pneumonia only in California.

[5] Exclusive of New York City.

NOTE.—Figures in parentheses are disease title numbers from the International List of Causes of Death, 1938.

Deaths registered, 1939, by months

Disease	Number of States [1]	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anthrax in man (7)	46				2		1	1	4	1				9
Chickenpox (38e)	47	18	14	18	15	7	11	7		1	1	3	14	[2] 110
Dengue (38f)	1								1					1
Diphtheria (10)	47	245	164	151	101	82	60	87	101	161	259	306	248	[2] 2,022
Dysentery (amoebic) (27b)	47	13	15	20	18	17	30	26	25	33	22	18	20	[2] 282
Dysentery (bacillary) (27a)	46	29	18	27	27	65	155	179	150	99	113	66	29	[2] 1,046
Dysentery (unspecified) (27c)	3	11	6	9	25	50	72	51	39	24	27	13	18	345
Encephalitis, epidemic or lethargic (37)	47	64	54	54	62	51	33	54	67	66	47	36	50	[2] 645
Influenza (33)	47	2,546	3,039	5,703	3,156	1,574	529	356	302	374	611	1,013	1,802	[2] 21,834
Malaria (28)	47	52	37	56	54	96	115	242	215	263	200	131	68	[2] 1,750
Measles (35)	47	132	179	180	192	186	83	50	17	15	15	16	32	[2] 1,171
Meningitis, meningococcus (6)	47	109	85	59	59	52	43	59	38	42	45	55	47	[2] 715
Mumps (44c)	45	10	8	8	9	10	8	8	6	4	2	6	5	[2] 87
Pellagra (69)	47	191	167	198	193	196	215	218	164	170	178	184	179	[2] 2,442
Pneumonia (all forms) (107-109)	47	11,987	10,947	11,455	7,633	5,497	3,218	2,909	2,695	3,143	4,092	5,423	7,325	[2] 77,602
Poliomyelitis (36)	47	26	25	16	27	37	46	70	128	142	113	68	42	[2] 756
Rabies in man (38b)	47	6	2	3	2	1	8	6	3	4	2	4	2	[2] 44
Rocky Mountain spotted fever (39c)	46			1	6	18	24	19	16	6		1	3	94
Scarlet fever (8)	47	115	105	141	97	60	49	33	26	24	46	60	88	[2] 855
Septic sore throat (115b)	43	182	187	151	187	167	153	140	159	126	161	149	189	1,951
Smallpox (34)	47	5	9	5	6	7	3	2				2		39
Tuberculosis (all forms) (13-22)	47	5,136	5,018	5,801	5,483	5,552	5,034	4,949	4,817	4,482	4,547	4,611	4,792	[2] 61,319
Tuberculosis (respiratory system) (13)	46	4,701	4,604	5,306	4,983	5,017	4,535	4,476	4,376	4,091	4,152	4,261	4,412	[2] 55,941
Tularaemia (26a)	47	37	13	19	8	5	9	11	9	6	8	40	90	[2] 258
Typhoid and paratyphoid fever (1-2)	47	102	87	97	83	90	172	253	332	311	186	139	97	[2] 1,997
Typhus fever (39a, b)	46	11	6	6	5	5	14	13	21	24	10	12	16	143
Undulant fever (5)	47	4	10	5	4	10	11	12	18	17	10	13	6	[2] 121
Whooping cough (9)	47	252	251	342	264	265	277	260	223	192	203	159	162	[2] 3,008

[1] The District of Columbia is also included but not counted as a State.

[2] The following numbers of deaths from certain diseases are not distributed by months but are included in the totals of the above table: Chickenpox, 1; diphtheria, 57; dysentery (amoebic), 25; dysentery (bacillary), 89; encephalitis, epidemic or lethargic, 7; influenza, 829; malaria, 221; measles, 84; meningitis, meningococcus, 22; mumps, 3; pellagra, 199; pneumonia (all forms), 1,278; poliomyelitis, 16; rabies in man, 1; scarlet fever, 1; tuberculosis (all forms), 1,097; tuberculosis (respiratory system), 1,027; tularaemia, 3; typhoid fever, and paratyphoid fever, 48; undulant fever, 1; whooping cough, 158.

NOTE.—Figures in parentheses are disease title numbers from the International List of Causes of Death, 1938.

COURT DECISION ON PUBLIC HEALTH

Trichinosis held compensable under workmen's compensation act.—(Massachusetts Supreme Judicial Court; *Destefano* v. *Alpha Lunch Co. of Boston, Vaida* v. *Same*, 30 N.E.2d 827; decided January 3, 1941.) In actions for breach of the implied warranty of fitness of food under a Massachusetts statute it appeared that the plaintiffs worked for the defendant company in one of its restaurants. Each plaintiff took two meals a day, except Sunday, at the restaurant, the meals forming part of the pay. Both plaintiffs became ill with trichinosis and testified that, during the 2 weeks preceding the onset of the disease, they ate pork and other products of the pig at the defendant's restaurant and nowhere else. The defendant was insured under the workmen's compensation act and the plaintiffs had made no reservation of common law rights under that act.

The supreme court took the view that what happened to the plaintiffs constituted a "personal injury" within the workmen's compensation act. "It differed from the inhalation of germs of disease, illustrated by *Smith's Case, Mass.*, 30 N.E.2d 536.[1] It resembled more the cases of poisoning therein cited, and *Osterbrink's Case*, 229 Mass. 407, 118 N.E. 657, where the employee drank muriatic acid by mistake for water." Also the court was of the opinion that such personal injury arose out of and in the course of the plaintiffs' employment.

"Since the injury was compensable under the workmen's compensation act, it will not support an action against the employer at law, whether in tort or in contract, or whether or not based upon a statute. * * *"

The action of the court below in ordering judgment for the defendant was sustained.

DEATHS DURING WEEK ENDED FEBRUARY 1, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 1, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	10,112	10,162
Average for 3 prior years	9,586	
Total deaths, first 5 weeks of year	49,361	48,141
Deaths under 1 year of age	558	577
Average for 3 prior years	557	
Deaths under 1 year of age, first 5 weeks of year	2,816	2,766
Data from industrial insurance companies:		
Policies in force	64,727,301	66,327,780
Number of death claims	14,799	13,817
Death claims per 1,000 policies in force, annual rate	11.9	10.9
Death claims per 1,000 policies, first 5 weeks of year, annual rate	10.6	10.4

[1] See Public Health Reports, January 31, 1941, p. 197.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 8, 1941

Summary

For the third successive week the incidence of influenza has recorded a decrease, with a total of 38,241 cases reported by the State health officers, as compared with 72,578 cases for the preceding week. The decline is noted for all geographic areas except the Pacific, where California reported 1,387 cases, as compared with 1,149 last week. It appears likely, however, that this increase may be attributed to delayed reports. West Virginia, with 6,046 cases; Virginia, with 5,976; and Texas, with 4,580, reported the highest incidence for the current week, although a sharp decline from the preceding week occurred in each of these States.

Of the other eight communicable diseases, only measles, poliomyelitis, and whooping cough were above the 5-year (1936–40) median expectancy. Also, the cumulative totals of these diseases for the first 6 weeks of the current year were above the cumulative medians. The number of cases of measles reported for the current week is approximately two and one-half times the 5-year median, while whooping cough was only slightly above the expectancy. The 29 cases of poliomyelitis (as compared with a 5-year median of 18) exceed the number reported for the corresponding week in any of the preceding 5 years. The cases were scattered, with only three States reporting as many as 3 cases.

Of 58 cases of smallpox, 25 cases were reported in the East North Central States (12 in Wisconsin and 8 in Michigan). One case of tularemia each was reported in Maryland, North Carolina, and South Carolina; and of 24 cases of endemic typhus fever, 14 were reported in Georgia.

For the current week the Bureau of the Census reports 10,214 deaths in 88 major cities of the United States, as compared with 10,112 for the preceding week and a 3-year (1938–40) average of 9,525 for the corresponding week. The current figure is 689 above the 3-year average as compared with a similar excess of 526 for the preceding week.

Telegraphic morbidity reports from State health officers for the week ended February 8, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leader simply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median	Week ended—		Median	Week ended—		Median	Week ended—		Median
	Feb. 8, 1941	Feb. 10, 1940	1936–40	Feb. 8, 1941	Feb. 10, 1940	1936–40	Feb. 8, 1941	Feb. 10, 1940	1936–40	Feb. 8, 1941	Feb. 10, 1940	1936–40
NEW ENG.												
Maine	0	1	2	63	1	3	70	209	155	0	0	0
New Hampshire	0	0	0	5	2	2	8	52	44	0	0	0
Vermont	0	0	0	26	------	------	10	3	27	0	0	0
Massachusetts	1	3	3	------	------	------	432	272	435	1	0	2
Rhode Island	0	1	1	10	------	------	0	111	99	0	0	0
Connecticut	0	0	1	317	2	4	30	177	177	0	0	0
MID. ATL.												
New York	11	22	34	[1] 427	[1] 36	[1] 50	3, 086	267	673	1	0	4
New Jersey	15	8	11	1, 156	29	29	844	66	66	2	0	1
Pennsylvania	25	24	44	------	------	------	2, 919	80	170	2	7	7
E. NO. CEN.												
Ohio	10	15	20	863	22	20	1, 836	22	24	3	1	3
Indiana	11	18	39	173	90	52	183	6	14	0	0	4
Illinois	19	30	32	195	134	134	1, 831	30	36	1	0	4
Michigan [2]	2	9	12	155	11	3	1, 320	251	251	0	0	1
Wisconsin	0	4	3	715	77	65	585	182	182	1	0	1
W. NO. CEN.												
Minnesota	3	3	3	698	1	1	5	359	120	2	0	1
Iowa	13	3	6	396	25	8	130	97	55	0	1	1
Missouri	4	10	10	68	33	162	74	5	10	1	0	1
North Dakota	0	3	2	84	61	15	11	13	13	0	0	0
South Dakota	1	1	1	22	4	4	18	7	4	0	0	0
Nebraska	1	0	3	14	2	2	6	31	22	0	0	0
Kansas	4	10	11	340	101	68	174	301	20	3	1	1
SO. ATL.												
Delaware	1	0	0	10	------	------	50	1	24	0	0	0
Maryland [2]	5	7	9	351	263	103	61	4	112	0	2	2
Dist. of Col	0	0	6	79	19	5	14	2	11	0	1	1
Virginia	6	12	22	5, 976	2, 662	------	498	42	99	1	2	10
West Virginia [2]	2	11	11	6, 046	460	151	125	15	15	0	4	3
North Carolina	16	25	24	599	121	67	182	107	107	0	1	2
South Carolina [3]	7	3	3	3, 060	1, 331	1, 009	47	6	23	2	2	2
Georgia [3]	7	2	11	1, 509	728	490	202	76	76	2	0	1
Florida	4	4	9	387	50	4	21	41	41	0	0	0
E. SO. CEN.												
Kentucky	11	10	9	246	86	86	203	35	70	3	0	6
Tennessee	10	9	13	2, 003	424	176	99	54	64	3	2	4
Alabama [3]	5	5	8	3, 561	536	334	476	73	73	5	2	2
Mississippi [2]	2	4	6	------	------	------	------	------	------	3	2	1
W. SO. CEN.												
Arkansas	12	8	8	767	1, 698	235	83	4	4	0	0	1
Louisiana [3]	5	11	11	218	360	44	7	15	15	2	0	0
Oklahoma	15	8	8	657	664	285	11	4	15	0	1	1
Texas [3]	36	51	51	4, 580	4, 437	940	218	270	167	5	3	5
MOUNTAIN												
Montana	10	1	1	116	7	7	8	28	20	0	0	1
Idaho	2	1	1	------	6	6	25	163	88	0	1	0
Wyoming	0	2	1	189	4	------	14	4	5	0	0	0
Colorado	9	9	9	311	26	------	85	32	34	0	0	0
New Mexico	2	1	3	9	7	7	72	9	29	0	0	0
Arizona	2	2	4	281	297	175	80	13	13	0	0	0
Utah [2]	2	0	0	66	125	------	15	190	81	0	1	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	3	2	52	35	4	70	676	182	0	0	1
Oregon	8	2	2	54	107	76	325	247	34	0	0	0
California	18	22	25	[4] 1, 387	1, 499	522	101	433	433	3	1	1
Total	317	378	491	38, 241	16, 583	4, 577	16, 664	5, 085	6, 519	46	35	89
6 weeks	1, 840	2, 628	3, 574	494, 449	82, 180	20, 877	70, 927	25, 982	31, 671	264	198	552

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 8, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Feb. 8, 1941	Feb. 10, 1940		Feb. 8, 1941	Feb. 10, 1940		Feb. 8, 1941	Feb. 10, 1940		Feb. 8, 1941	Feb. 10, 1940	
NEW ENG.												
Maine	0	0	0	9	19	25	0	0	0	0	0	0
New Hampshire	0	0	0	4	4	7	0	0	0	0	0	0
Vermont	0	0	0	4	9	16	0	0	0	0	0	0
Massachusetts	0	1	0	143	134	250	0	0	0	1	2	1
Rhode Island	0	0	0	10	12	30	0	0	0	0	0	1
Connecticut	0	0	0	43	90	97	0	0	0	1	3	1
MID. ATL.												
New York	0	2	1	380	665	690	0	0	0	5	6	5
New Jersey	0	0	0	309	333	172	0	0	0	0	2	1
Pennsylvania	1	0	0	248	370	472	0	0	0	0	8	8
E. NO. CEN.												
Ohio	0	1	1	296	277	313	5	0	3	1	0	1
Indiana	0	0	0	145	221	221	0	6	6	4	1	1
Illinois	2	0	0	454	583	622	0	2	11	3	1	2
Michigan [2]	1	1	1	142	261	497	8	2	3	0	0	4
Wisconsin	3	1	0	165	160	298	12	5	5	0	0	1
W. NO. CEN.												
Minnesota	1	0	0	49	112	150	6	5	8	0	0	0
Iowa	2	4	0	46	70	182	3	9	33	0	0	1
Missouri	3	0	0	76	91	145	3	2	17	0	1	1
North Dakota	0	0	0	16	28	28	0	0	2	0	0	1
South Dakota	0	0	0	17	39	30	0	4	6	1	0	0
Nebraska	0	0	0	25	20	53	0	0	5	0	0	0
Kansas	0	0	0	72	75	209	0	1	10	0	0	0
SO. ATL.												
Delaware	0	0	0	7	10	7	0	0	0	0	0	0
Maryland [3]	1	0	0	82	62	62	0	0	0	2	2	1
Dist. of Col.	0	0	0	9	21	18	0	0	0	1	1	0
Virginia	0	0	0	47	28	40	0	0	0	4	1	4
West Virginia [3]	2	0	0	30	77	50	0	0	0	2	0	2
North Carolina	3	0	0	48	53	53	0	0	0	2	3	3
South Carolina [3]	0	0	0	6	3	3	0	0	0	0	3	3
Georgia [3]	0	2	0	21	25	19	0	2	0	0	2	3
Florida	2	0	0	2	11	10	0	0	0	0	3	2
E. SO. CEN.												
Kentucky	0	0	1	83	94	68	0	0	0	4	3	3
Tennessee	0	0	0	102	64	44	0	1	1	2	0	3
Alabama [3]	0	2	1	14	13	22	0	0	1	1	3	3
Mississippi [3]	1	2	1	5	3	8	1	0	0	0	1	1
W. SO. CEN.												
Arkansas	1	0	0	9	3	15	2	3	1	2	2	2
Louisiana [3]	0	0	0	4	13	13	2	0	0	3	2	5
Oklahoma	1	1	1	18	31	31	1	1	2	0	1	2
Texas [3]	1	1	1	75	75	89	5	1	5	10	3	3
MOUNTAIN												
Montana	0	0	0	25	53	53	1	0	11	1	0	1
Idaho	0	1	0	16	42	26	1	1	2	0	1	1
Wyoming	0	0	0	8	4	12	0	0	4	0	0	0
Colorado	0	0	0	37	59	59	6	13	13	0	0	0
New Mexico	1	0	0	4	13	25	0	0	0	3	3	3
Arizona	0	0	0	7	13	22	2	1	0	1	0	0
Utah [2]	1	0	0	7	31	31	0	0	0	0	0	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	0	0	24	59	62	0	3	12	0	3	2
Oregon	0	0	0	18	22	45	0	0	2	1	1	1
California	2	2	2	105	140	200	0	1	11	5	10	4
Total	29	21	18	3,460	4,595	6,148	58	63	371	60	72	87
6 weeks	217	203	124	19,470	25,951	35,937	304	453	1,828	445	475	661

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 8, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough: Week ended Feb. 8, 1941	Whooping cough: Week ended Feb. 10, 1940	Division and State	Whooping cough: Week ended Feb. 8, 1941	Whooping cough: Week ended Feb. 10, 1940
NEW ENG.			SO. ATL.—continued		
Maine	8	77	Georgia [3]	15	38
New Hampshire	2	4	Florida	17	18
Vermont	8	47	E. SO. CEN.		
Massachusetts	272	144	Kentucky	38	60
Rhode Island	6	13	Tennessee	73	41
Connecticut	52	64	Alabama [3]	49	7
MID. ATL.			Mississippi [2]		
New York	337	394	W. SO. CEN.		
New Jersey	102	95	Arkansas	25	6
Pennsylvania	435	341	Louisiana [3]	1	9
E. NO. CEN.			Oklahoma	31	4
Ohio	341	92	Texas [3]	343	118
Indiana	9	46	MOUNTAIN		
Illinois	107	80	Montana	7	1
Michigan [3]	175	115	Idaho	14	5
Wisconsin	150	93	Wyoming	9	2
W. NO. CEN.			Colorado	59	20
Minnesota	58	25	New Mexico	13	37
Iowa	29	10	Arizona	5	26
Missouri	53	15	Utah [2]	74	552
North Dakota	18	18	Nevada	0	
South Dakota	8	11	PACIFIC		
Nebraska	15	4	Washington	123	19
Kansas	70	55	Oregon	13	36
SO. ATL.			California	424	154
Delaware	8	9	Total	4,392	3,230
Maryland [2]	94	165	6 weeks	25,434	16,720
Dist. of Col.	5	15			
Virginia	232	57			
West Virginia [3]	102	6			
North Carolina	302	76			
South Carolina [3]	61	6			

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Feb. 8, 1941, 24 cases as follows: South Carolina, 5; Georgia, 14; Alabama, 2; Louisiana, 2; Texas, 1.
[4] Approximately 1,000 delayed reports for November and December included.

WEEKLY REPORTS FROM CITIES

City reports for week ended January 25, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	163	1,347	138	2,653	933	1,728	35	365	18	1,119	-------
Current week [1]	67	6,912	205	6,206	739	1,129	4	375	12	1,202	-------
Maine:											
Portland	0	1	1	1	6	4	0	0	0	13	36
New Hampshire:											
Concord	0	------	0	0	0	1	0	1	0	0	16
Manchester	0	------	2	0	1	13	0	0	0	0	15
Nashua	0	------	0	0	0	7	0	1	0	1	7
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	3	0	4	0	0	0	0	0	0	11
Rutland	0	------	0	0	0	0	0	0	0	0	9
Massachusetts:											
Boston	0	------	6	88	51	41	0	9	0	80	349
Fall River	0	------	1	0	2	3	0	1	0	4	51
Springfield	0	1	1	3	1	10	0	0	0	1	53
Worcester	0	------	0	52	6	11	0	3	1	0	78
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	19
Providence	0	12	3	1	11	0	0	2	0	5	101
Connecticut:											
Bridgeport	0	58	1	1	3	3	0	0	0	6	54
Hartford	0	80	0	1	5	1	0	1	0	1	54
New Haven	0	25	2	0	1	7	0	0	1	25	49
New York:											
Buffalo	0	20	5	57	13	21	0	5	0	16	165
New York	17	522	10	1,548	111	220	0	82	1	139	1,693
Rochester	0	------	0	6	4	3	0	0	0	8	74
Syracuse	0	------	0	0	3	3	0	0	0	3	44
New Jersey:											
Camden	0	15	3	24	2	4	0	3	0	2	47
Newark	0	41	0	122	17	20	0	10	0	7	137
Trenton	0	6	2	2	5	66	0	0	0	1	50
Pennsylvania:											
Philadelphia	1	50	7	773	50	100	0	28	0	70	701
Pittsburgh	0	66	8	1	29	5	0	9	0	40	226
Reading	1	------	0	229	5	0	0	1	0	15	33
Scranton	0	------	------	1	------	0	0	------	0	1	------
Ohio:											
Cincinnati	0	43	2	28	11	14	0	5	0	2	145
Cleveland	3	437	2	447	17	29	0	9	0	93	216
Columbus	1	6	6	10	6	8	0	3	0	9	104
Toledo	0	2	1	3	7	7	0	4	1	22	91
Indiana:											
Anderson	0	------	0	0	2	0	0	0	0	0	10
Fort Wayne	0	------	0	13	3	1	0	1	0	0	29
Indianapolis	2	------	2	6	20	19	0	3	0	15	131
Muncie	0	------	1	11	1	6	0	1	0	0	13
South Bend	0	------	0	2	2	0	0	0	0	0	23
Terre Haute	0	1	0	0	1	0	0	0	0	0	12
Illinois:											
Alton	0	1	1	0	1	4	0	0	0	0	9
Chicago	10	45	3	900	47	170	0	48	3	63	803
Elgin	0	------	0	3	4	1	0	0	0	0	21
Moline	0	------	0	4	0	0	0	0	0	0	15
Springfield	0	------	0	1	6	5	0	0	1	2	28
Michigan:											
Detroit	4	86	8	797	17	92	0	10	0	119	306
Flint	0	------	2	18	7	3	0	0	0	11	37
Grand Rapids	0	------	1	0	1	11	0	0	0	16	36
Wisconsin:											
Kenosha	0	------	0	8	0	1	0	0	0	0	9
Madison	0	------	0	2	0	1	0	0	0	1	10
Milwaukee	0	------	0	15	5	39	0	0	0	54	96
Racine	------	------	------	------	------	------	------	------	------	------	------
Superior	0	------	0	0	0	2	0	0	0	1	8

[1] Figures for Barre, Racine, and Boise estimated; reports not received.

City reports for week ended January 25, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0	3	0	0	2	0	1	0	0	5	21
Minneapolis	0	------	1	909	1	8	0	2	0	13	112
St. Paul	1	2	2	2	5	6	0	4	0	5	69
Iowa:											
Cedar Rapids	0	------	------	1	------	4	0	------	0	0	------
Davenport	0	------	------	0	------	2	0	------	0	1	------
Des Moines	3	------	0	0	0	11	0	0	0	1	28
Sioux City	0	------	------	0	------	3	0	------	0	8	------
Waterloo	0	------	------	1	------	2	0	------	0	4	------
Missouri:											
Kansas City	0	1	5	3	12	12	3	5	0	6	115
St. Joseph	0	------	0	0	9	0	0	0	0	2	27
St. Louis	1	31	9	7	26	19	0	7	1	14	270
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	7	4
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	------	1	------	0	0	------	0	0	------
South Dakota:											
Aberdeen	0	------	------	0	------	2	0	------	0	0	------
Sioux Falls	0	------	0	0	0	1	0	0	0	0	7
Nebraska:											
Lincoln	1	------	------	0	------	1	0	------	0	1	------
Omaha	0	------	1	0	10	8	0	1	0	0	65
Kansas:											
Lawrence	0	27	0	1	0	0	0	0	0	0	3
Topeka	0	------	0	20	0	1	0	0	0	0	11
Wichita	1	3	1	2	5	2	0	1	0	15	32
Delaware:											
Wilmington	0	------	0	4	6	1	0	0	0	7	42
Maryland:											
Baltimore	2	105	5	5	16	35	0	10	0	60	270
Cumberland	0	1	0	2	0	0	0	0	0	0	9
Frederick	0	------	0	0	0	0	0	0	0	0	3
Dist. of Col.:											
Washington	1	168	2	5	14	11	0	9	0	7	171
Virginia:											
Lynchburg	0	------	0	2	1	1	0	0	0	0	15
Norfolk	0	260	1	5	5	1	0	3	0	3	37
Richmond	0	------	7	2	4	2	0	3	0	0	77
Roanoke	0	------	0	26	4	1	0	0	0	25	26
West Virginia:											
Charleston	0	19	1	5	1	1	0	0	0	0	10
Huntington	0	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	2	0	2	2	0	0	0	8	29
North Carolina:											
Gastonia	0	3	------	0	------	0	0	------	0	1	------
Raleigh	0	15	0	0	2	1	0	0	0	6	7
Wilmington	0	------	0	0	4	0	0	0	0	0	15
Winston-Salem	3	18	0	1	0	1	0	2	0	27	27
South Carolina:											
Charleston	0	2,274	4	10	7	1	0	2	0	0	33
Florence	1	322	0	19	0	0	0	1	0	0	10
Greenville	0	------	0	2	7	0	0	1	0	3	20
Georgia:											
Atlanta	0	693	12	1	7	6	0	10	1	1	112
Brunswick	0	1	1	0	1	0	0	0	0	0	5
Savannah	0	256	7	0	5	0	0	2	0	0	51
Florida:											
Miami	0	46	2	0	3	1	0	0	0	1	63
Tampa	2	3	1	0	2	1	0	2	0	0	36
Kentucky:											
Ashland	0	6	2	0	0	1	0	1	0	1	11
Covington	1	2	0	3	3	2	0	1	0	0	22
Lexington	0	------	3	20	3	1	0	2	0	2	22
Louisville	0	93	1	21	9	17	0	2	0	10	66
Tennessee:											
Knoxville	0	519	4	1	9	4	0	2	0	0	58
Memphis	0	147	11	8	6	4	0	5	0	13	96
Nashville	0	------	6	4	7	6	0	1	1	12	73
Alabama:											
Birmingham	1	673	8	5	9	0	0	1	0	1	96
Mobile	1	22	7	0	5	0	0	2	0	0	35
Montgomery	0	87	------	2	------	4	0	------	0	0	------

City reports for week ended January 25, 1941—Continued

State and city	Diphtheria cases	Influenza: Cases	Influenza: Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Arkansas:											
Fort Smith	0	3	------	0	------	0	0	------	0	4	------
Little Rock	0	116	1	2	11	0	0	2	0	2	58
Louisiana:											
Lake Charles	0	------	0	1	1	0	0	0	0	0	7
New Orleans	2	61	5	0	24	8	0	11	2	5	187
Shreveport	0	------	3	0	3	0	0	3	0	0	42
Oklahoma:											
Oklahoma City	0	------	1	4	4	3	0	0	0	2	54
Tulsa	2	------	1	0	6	0	1	2	0	4	37
Texas:											
Dallas	0	7	7	2	5	6	0	4	0	0	85
Fort Worth	0	------	3	36	4	2	0	1	0	0	43
Galveston	1	57	0	0	1	0	0	0	0	1	16
Houston	1	106	4	1	8	2	0	6	0	0	105
San Antonio	1	32	8	0	7	2	0	7	0	5	76
Montana:											
Billings	0	------	0	0	1	2	0	1	0	0	11
Great Falls	0	------	0	0	2	7	0	0	0	0	10
Helena	0	98	0	0	1	0	0	1	0	0	12
Missoula	0	97	1	1	0	0	0	0	0	0	6
Idaho:											
Boise	------	------	------	------	------	------	------	------	------	------	------
Colorado:											
Colorado Springs	0	------	0	2	2	2	0	1	0	8	10
Denver	1	65	3	6	9	8	0	3	0	11	109
Pueblo	0	------	0	0	1	1	0	1	0	2	11
New Mexico:											
Albuquerque	0	1	0	4	1	0	0	3	0	0	15
Utah:											
Salt Lake City	2	------	0	7	4	2	0	0	0	9	35
Washington:											
Seattle	0	110	1	5	4	3	0	5	0	8	104
Spokane	0	1	2	0	0	2	0	1	0	2	45
Tacoma	0	------	0	1	2	1	0	1	0	10	45
Oregon:											
Portland	0	6	1	18	2	4	0	3	0	0	90
Salem	0	6	------	1	------	0	0	------	0	2	------
California:											
Los Angeles	3	173	2	4	5	27	0	17	0	48	442
Sacramento	4	9	3	0	2	7	0	3	0	1	42
San Francisco	0	30	1	0	6	1	0	6	0	41	197

State and city	Meningitis, meningococcus: Cases	Meningitis, meningococcus: Deaths	Poliomyelitis cases	State and city	Meningitis, meningococcus: Cases	Meningitis, meningococcus: Deaths	Poliomyelitis cases
New York:				South Carolina:			
Buffalo	1	0	0	Greenville	1	0	0
New York	2	1	1	Florida:			
New Jersey:				Miami	0	0	2
Newark	1	0	0	Alabama:			
Pennsylvania:				Birmingham	1	1	0
Philadelphia	2	1	0	Louisiana:			
Ohio:				Shreveport	0	1	0
Cincinnati	0	0	1	Texas:			
Cleveland	1	0	0	Dallas	0	0	1
Indiana:				Galveston	1	0	0
Indianapolis	1	1	0	Oregon:			
Illinois:				Portland	1	0	0
Chicago	0	0	2	California:			
Wisconsin:				Los Angeles	1	0	1
Milwaukee	1	0	0				

Dengue fever.—Cases: Charleston, S. C., 3.
Encephalitis, epidemic or lethargic.—Cases: New York, 6.
Pellagra.—Cases: Charleston, S. C., 2; Atlanta, 1; Savannah, 1.
Rabies in man.—Deaths: San Francisco, 1.
Typhus fever.—Cases. New York, 3; Charleston, S. C., 1; Atlanta, 1; Miami, 1; Tampa, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 4, 1941.—During the week ended January 4, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	2	13	3	4	18				5	45
Chickenpox		2	2	78	311	34	10	59	87	583
Diphtheria		54	3	15		7	1			80
Dysentery				2						2
Influenza		254	16		438	6			826	1,540
Lethargic encephalitis		1								1
Measles		147	11	21	490	71	32	128	195	1,095
Mumps				47	65	16	1	12	8	149
Pneumonia		6			40	3			17	66
Poliomyelitis				1						1
Scarlet fever	4	30	1	53	137	8		19	9	261
Tuberculosis		13	5	17	40	2		1		78
Typhoid and paratyphoid fever				8					1	9
Whooping cough			19	49	134	5	1	2	10	220

CUBA

Provinces—Notifiable diseases—4 weeks ended December 7, 1940.—During the 4 weeks ended December 7, 1940, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer		1		6		8	15
Chickenpox		2				1	3
Diphtheria		26		1	2	7	36
Hookworm disease				1			1
Leprosy				1			1
Malaria	67	15	2	7	2	72	165
Measles			2				2
Poliomyelitis		2					2
Scarlet fever				2			2
Trachoma				3			3
Tuberculosis	28	32	12	27	16	28	143
Typhoid fever	31	79	7	22	13	17	169

JAMAICA

Communicable diseases—4 weeks ended January 18, 1941.—During the 4 weeks ended January 18, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	1	11	Poliomyelitis		1
Diphtheria	2	4	Puerperal sepsis		6
Dysentery	8	8	Tuberculosis	24	83
Leprosy	1		Typhoid fever	5	36

VENEZUELA

Caracas—Poliomyelitis.—An increase in the number of poliomyelitis cases has been reported in Caracas, Venezuela (population 204,000), with 9 cases in November 1940 and 36 cases from December 1, 1940, to January 11, 1941, as compared with 6 cases from January to October (inclusive) 1940. The disease was stated to be mild, with only 4 deaths reported.

YUGOSLAVIA

Notifiable diseases—4 weeks ended December 1, 1940.—During the 4 weeks ended December 1, 1940, certain notifiable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	15	1	Paratyphoid fever	16	
Cerebrospinal meningitis	59	14	Poliomyelitis	8	
Diphtheria and croup	730	34	Scarlet fever	393	1
Dysentery	682	91	Sepsis	7	3
Erysipelas	194	3	Tetanus	25	8
Favus	4		Typhoid fever	458	33
Leprosy	1		Typhus fever	23	1
Lethargic encephalitis	1				

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of January 31, 1941, pages 206-210. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Smallpox

Japan.—According to a report dated January 23, 1941, an outbreak of smallpox has been reported in Japan. In Aomori Prefecture new cases increased to 36 between January 1 and 21, 1941. For the same period Akita Prefecture reported 5 cases and Tokyo Prefecture 5 cases. Three deaths had occurred.

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Public Health Reports

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U.S. PUBLIC HEALTH SERVICE
1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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QUALIFICATIONS OF PROFESSIONAL PUBLIC HEALTH PERSONNEL [1]

IV. SANITATION PERSONNEL

By Mayhew Derryberry, *Senior Health Education Analyst,* and George Caswell, *United States Public Health Service*

The sanitarian, sanitary inspector, or health inspector, was the first staff worker in the field of public health. Following Chadwick's sanitation survey in England [2] and the energetic work of Sir John Simon,[3] the sanitary inspector assumed a major role in the public health field. His early activities, beginning with environmental sanitation and including the removal of health hazards, were largely carried out through regulatory measures. The same method of procedure continues throughout much of the country today, although in some departments educational aspects of the position are emphasized.

In the past, when inspection and enforcement of the sanitary code were the chief functions of the sanitation worker, the only training required was a knowledge of the code to be enforced. More recently, however, with the advances in sanitary science, modern health departments no longer limit their activities to the development and enforcement of codes but have broadened their functions to include supervision over the hygiene of housing, control of milk and water supplies, precautionary measures against industrial hazards, and many other phases of community life formerly not considered. To perform these tasks, workers are needed who not only know the technical aspects of the work but also have an understanding of methods of dealing with and educating the public.

To what extent, then, is the present force of sanitary engineers and sanitary inspectors trained for these more complicated tasks? How

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[1] From the Division of Public Health Methods, National Institute of Health. This is the fourth in the series: Qualifications of Professional Public Health Personnel. The preceding papers were: I. Plan and Scope of the Survey; II. Health Officers and Other Medical Personnel; and III. Nurses.

This survey was made possible through the cooperation of State and local health officers and members of their staffs throughout the country. Acknowledgment is also made of the extensive clerical assistance provided by the Works Progress Administration, Project No. 765-23-3-2. Data collected in 1938.

[2] *Cf.* Sanitary Condition of the Labouring Population of Great Britain, Report of the Poor Law Commissioners to Parliament, London, 1842.

[3] Simon, Sir John: English Sanitary Institutions Reviewed in Their Course of Development and in Some of Their Political and Social Relations. 2d ed. J. Murray, London, 1897.

many are working without any special preparation, and how much training will be required to provide a well-qualified corps of workers? To answer these questions and furnish similar facts for other types of personnel was the primary objective of a general survey of professional employees in health departments conducted recently by the Public Health Service.[4]

ADMINISTRATIVE CLASSIFICATION

In the course of the survey, individual schedules were collected from 4,443 sanitation workers in 1,114 health departments in the United States, including Alaska, Hawaii, and Puerto Rico. Although the study was not concerned with nonprofessional employees, there were 102 schedules from individuals whose functions seemed to differ so strikingly from those of the majority of the sanitation workers that it was decided to eliminate them from the analysis. Among the titles reported by this small group of employees were: (*a*) sanitary patrolman, (*b*) rat-, vermin-, or insect-control worker, (*c*) dog catcher, (*d*) poundmaster, and (*e*) complaint man.

The remaining 4,341 employees were classified according to function[5] as: (*a*) Directors of sanitary bureaus, (*b*) sanitary engineers (not heads of bureaus), and (*c*) staff sanitarians. From table 1 it will be seen that city health departments employ half of all the sanitation personnel working in official agencies; States and counties employ approximately two-fifths and three-fifths, respectively, of the remainder. However, city health departments employ fewer than one in ten of the trained professional sanitary engineers not directors of bureaus. That is, a sanitary engineer is seldom found in a city health department unless he is directing the sanitation corps. In some instances, the head of a bureau is a physician or veterinarian rather than an engineer. The relatively large number of sanitary engineers in State health departments is explained by the fact that State personnel generally serve as consultants to county and other smaller units.

Sanitation workers are predominantly white males. Only 1.4 percent of the total are women, mostly staff sanitarians employed in such positions as beauty-shop inspector or boarding-home inspector. Only 5 percent of the entire group are other than white. There are 22 Negro staff workers in cities; the remainder are Eurasian or "Hawaiian" or did not report color.[6]

[4] For a discussion of the method and coverage of the entire study, see the first paper in this series: Plan and Scope of the Survey.

[5] Directors of sanitary bureaus were classified as reported, regardless of status or training as engineers. Included with directors are those reported as acting or deputy directors. The group called "sanitary engineers" includes only professional engineers and industrial hygiene men, trained in engineering but not claiming supervisory control over any bureau. Staff sanitarians and veterinarians make up the third category.

[6] Most of those who are other than white or Negro are employed in Hawaii and Puerto Rico.

TABLE 1.—*Sanitation personnel by professional classification and employing jurisdiction*

Professional classification	Total		Employed by—					
			State		County		City	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	4,341	100 0	977	22.5	1,203	27.7	2,161	49.8
Director [1]	466	100 0	156	33.5	82	17 6	228	48.9
Sanitary engineer [2]	481	100 0	266	55.3	172	35.8	43	8.9
Staff	3,394	100 0	555	16.3	949	28 0	1,890	55.7

[1] Includes all reported as heads of sanitary corps or bureaus.
[2] Includes only trained sanitary engineers (or professional engineers) not heads of corps or bureaus.

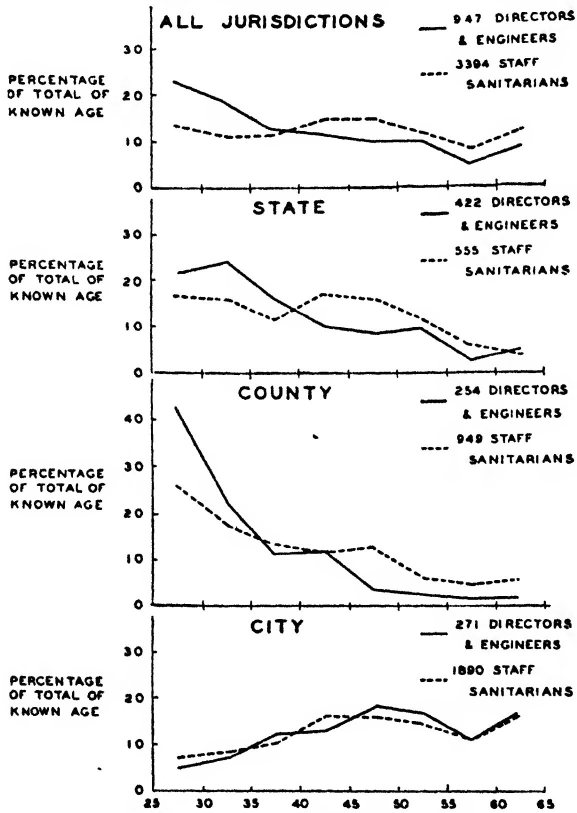

FIGURE 1.—Age of sanitation personnel, by class of position and employing jurisdiction.

In contrast to the homogeneity of sex and color, there is a complete lack of it with respect to age. There are wide jurisdictional variations in average age, and in both State and county departments staff workers are older than their supervisors. In the cities the two groups are of approximately the same age. Figure 1 shows the complete age distribution by type of position and jurisdiction. It might be pointed

out that city employees, averaging 48 years old, are, as a group, 9 years older than county employees and almost 8 years older than State employees. Staff workers average over 44 years old, 4 years more than directors and engineers.

The age relationship shown in figure 1 indicates an undesirable administrative situation. If the older employees, most of whom have several years of experience, were well trained, they should administer the program but, in reality, the result is that the older men are expected to accept supervision by those who are their juniors in both age and service.

Age differences such as those shown in figure 1 must be kept in mind in any interpretation of the material, whether it refers to training or experience. For example, only one-seventh of the city workers are under 35, but twice as many are 55 or over. In State and county departments the proportions are reversed. Such contrasts in age levels will undoubtedly have bearing not only on the present training problem but on future employment needs as well.

EDUCATIONAL QUALIFICATIONS

Academic training.—In analyzing the educational qualifications of sanitation workers, each individual was tabulated at the highest level attained, on the assumption that he had successfully completed work in the lower levels. Individuals reporting college training were assumed to have completed high school even though they did not report it. Those who indicated that they had graduate degrees were given credit for both high school and college graduation. The resulting tabulation of the level of educational training for each of the professional and jurisdictional categories is shown in table 2 in which all work of college grade is reported together.[7] Only in cases in which a degree was reported is it indicated whether college work was taken in an academic or a professional course.

Fifty-six percent of currently employed sanitation workers have had some college work and 36 percent have degrees. On the other hand, 15 percent have had less than high school training and almost one-third have gone no further than high school.

Sanitary engineers, nine-tenths of whom have college degrees, have the most extensive academic training and by far the best professional background of any of the groups. This is a much better showing than is made by the directors of sanitary bureaus, of whom one-third have had no college work and fewer than half have degrees. Fewer than half of the staff workers have attended college; only about one-fourth have college degrees. At the other extreme in level of training, there are over 17 percent of staff employees who have less than high school

[7] This fact should be noted when table 2 is compared with similar tables analyzing the training of physicians and nurses. In the latter, academic and professional work are analyzed separately. The manner in which the sanitarians reported their training precluded making such distinctions.

training and an additional fifth who attended high school but were not graduated.

TABLE 2.—*Level of academic training reported by sanitation personnel, according to jurisdictional and administrative classification*

Level of academic training reported	All sanitation personnel	State	County	City	Directors	Sanitary engineers	Staff
	Number						
Total	4,341	977	1,203	2,161	466	481	3,394
Less than high school	651	121	86	444	47	2	602
High school, no college	1,255	215	285	755	103	9	1,143
Less than graduation	779	132	152	495	65	3	711
Graduation	476	83	133	260	38	6	432
College work	2,169	565	742	862	274	399	1,496
No degree	880	147	328	405	96	43	741
Academic degree	639	233	239	167	88	185	366
Professional degree	650	185	175	290	90	171	389
Graduate training	266	76	90	100	42	71	153
	Percentage						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Less than high school	15.0	12.4	7.1	20.6	10.1	0.4	17.7
High school, no college	28.9	22.0	23.7	34.9	22.1	1.8	33.7
Less than graduation	17.9	13.5	12.6	22.9	13.9	.6	21.0
Graduation	11.0	8.5	11.1	12.0	8.2	1.2	12.7
College work	50.0	57.8	61.7	39.9	58.8	83.0	44.1
No degree	20.3	15.0	27.3	18.8	20.6	8.9	21.8
Academic degree	14.7	23.9	19.9	7.7	18.9	38.5	10.8
Professional degree	15.0	18.9	14.5	13.4	19.3	35.6	11.5
Graduate training	6.1	7.8	7.5	4.6	9.0	14.8	4.5

Jurisdictional differences in academic and professional education among sanitation workers are similar to those previously shown in the papers analyzing the training of nurses and physicians. State and county workers have a much better academic background than the city sanitation workers in all the classifications. Fewer than half of the city workers have attended college and only one-fourth have degrees. An additional fifth report no high school training; about the same proportion have attended high school but not graduated.

Despite the meager educational background of a large proportion of the workers, the present situation represents a considerable improvement over the conditions revealed by the White House Conference in 1930.[8] (See table 3.) Only in the proportion who have less than high school training was the showing in 1930 better than that in 1938. Even this difference may result from the White House Conference tabulation of 23.2 percent of the total with "high school training unspecified." It is most likely that many of this unspecified group had no high school education.

[8] See Public Health Organization, vol. IIA, Reports of the White House Conference on Child Health and Protection, The Century Company, New York, 1932

TABLE 3.—*Comparison of the educational training reported by sanitation personnel in 1938 and 1930*

Educational attainment reported	Percentage with specified training as reported in—	
	United States Public Health Service Survey, 1938	White House Conference Survey,[1] 1930
Less than high school	15.0	11.2
High school, no college training	28.9	48.6
Not graduated	17.9	14.7
Graduated	11.0	33.9
College	56.1	40 2
Less than graduation	20.3	19.4
Graduation	35.8	20 8
Number in survey	4,341	982

[1] In preparing the percentages for comparison with the present survey, the following assumptions were made: 4 years of college was considered graduation, "unspecified" college work was considered as no college work; and those representing the difference between the number reporting college work and the number reporting no high-school work were considered to have attended high school.

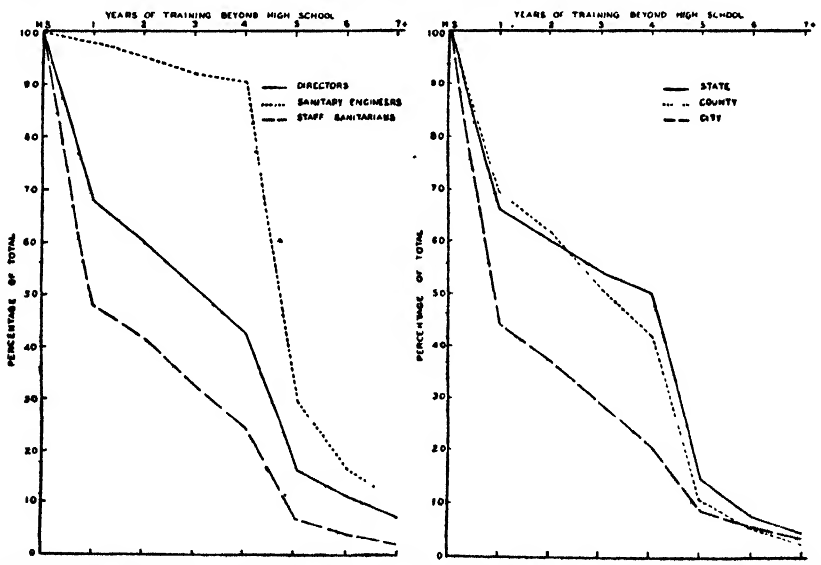

FIGURE 2.—Aggregate years of training beyond high school among sanitation personnel, percentages of functional and jurisdictional groups with specified years of training.

Another measure of the educational preparation of sanitarians is the reported length of their combined academic and professional training. As is shown in table 3, more than 40 percent of the entire group either do not report or have not had any training beyond high school. Among those who do report training of college level, the modal number of years reported is 4. Although relatively few report more than 4 years, there are 115 reporting 8 or more years.

The differences in the length of training for the administrative and jurisdictional groups are shown in figure 2. This chart has been constructed to show, by single years, the proportion having at least that number of years of educational work. The most outstanding difference between the groups is the superiority of the engineers' training. Ninety percent of them have had 4 or more years of training beyond high school, but only 42 percent of the directors and 24 percent of the staff have had that amount of training. The engineers exceed the other two groups at every point on the scale, although the difference is at its maximum at 4 years or more.

The general lower level of educational attainment for sanitation employees from cities as shown in figure 2 and table 3 is consistent with the findings previously reported for medical and nursing staffs.[9] It is obvious, therefore, that city health departments especially should consider the training needs of their present sanitation employees and raise their standards of employment in order that the quality of their sanitation personnel may be improved.

In tables 2 and 3 it was shown that 36 percent of the sanitation workers have either an academic or a professional degree. The types of degrees included under those two headings varied widely among the several groups; the most commonly reported ones are shown in table 4. Interpretation of the meaning of degrees in terms of the type of training they represent cannot be made too rigidly because of the variation in the practices of colleges granting degrees. In some institutions the degree of Bachelor of Science or Bachelor of Science in Sanitary Engineering, both of which were reported as academic degrees, would imply the same training as that represented by the degree of Sanitary Engineer (a definitely professional degree) in another institution. Since no criteria were available by which academic degrees could be distinguished from strictly professional ones, all have been tabulated exactly as they were recorded on the schedules. Twenty-one percent of sanitation personnel reported academic degrees; 15 percent reported professional degrees. Among the former, three out of four are bachelors of science. The number of such degrees is almost equal to the number of professional degrees; and, as stated above, it is probable that a majority of the science degrees, though reported as academic, belong in the professional training category.

The largest single group of professional degrees reported are in veterinary medicine.[10] Among the "other" category of bachelor's degrees and professional degrees were: Bachelor of Education, Bachelor of Philosophy, degrees in accountancy, and the various degrees granted by agricultural colleges. Among the sanitation

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[9] See Nos. II and III of this series: Health Officers and Other Medical Personnel, and Nurses.

[10] Variously reported as: D. V. M., D. V. S., D. V., M. D. C., V. S., or B. V. Sc.

employees are 18 physicians whose functions in their departments are such that they are included here rather than with physicians in medical bureaus. Six are directors, 10 are in staff positions, and 2 are classified as sanitary engineers.

TABLE 4.—*Academic and professional degrees among sanitation personnel, by employment status*

Degree reported	All sanitation personnel	State	County	City	Directors	Sanitary engineers	Staff
	Number						
Total	4,341	977	1,203	2,161	466	481	3,394
No degree [1]	2,786	483	699	1,604	246	54	2,486
Academic degree	905	309	329	267	130	256	519
Bachelor of arts	171	41	88	42	30	16	125
Bachelor of science	631	238	220	173	86	206	339
Other bachelor's degrees	112	32	27	53	18	34	60
Professional degree	650	185	175	290	90	171	389
Doctor of medicine [2]	18	6	2	10	6	2	10
Civil engineer or sanitary engineer	74	37	28	9	11	44	19
Doctor of veterinary medicine	279	26	50	203	41	1	237
Bachelor of laws	27	6	-------	21	7	----------	20
Pharmacy	66	23	8	35	10	----------	56
Other [3]	204	98	88	18	20	132	52
	Percentage						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No degree [1]	64.2	49.5	58.1	74.2	52.8	11.2	73.2
Academic degree	20.8	31.6	27.3	12.4	27.9	53.2	15.3
Bachelor of arts	3.9	4.2	7.3	1.9	6.4	3.3	3.7
Bachelor of science	14.5	24.4	18.3	8.0	18.5	42.8	10.0
Other bachelor's degrees	2.6	3.3	2.2	2.5	3.9	7.1	1.8
Professional degree	15.0	18.9	14.6	13.4	19.3	35.6	11.5
Doctor of medicine [2]	.4	.6	.2	.5	1.3	.4	.3
Civil engineer or sanitary engineer	1.7	3.8	2.3	.4	2.4	9.1	.6
Doctor of veterinary medicine	6.4	2.7	4.2	9.4	8.8	.2	7.0
Bachelor of laws	.6	.6	----------	1.0	1.5	----------	.6
Pharmacy	1.5	2.4	.7	1.6	2.1	----------	1.6
Other [3]	4.7	10.0	7.3	.8	4.3	27.4	1.5

[1] Includes those having no college work as well as those whose college work is incomplete.
[2] Includes 1 with doctor of dental science
[3] Largely degrees in accountancy, agriculture, and education

It is of some interest to note that 27 individuals have degrees in law and 66 have degrees in pharmacy, chiefly State and city employees. The presence of lawyers in city sanitation staffs is suggestive of the continuance of regulatory practices as one of the functions long identified with the sanitary bureau.

Public health training.—The preceding tables have shown that a large proportion of employees in the sanitary corps of health departments have a limited educational background. This might not be a serious handicap to efficient health service if the workers had also received specific training in the theory and methods of public health.

Table 5, however, shows that the limitations of their public health training are even more pronounced than those of their academic background.

Only 29 percent of the sanitation employees in official health departments have had any public health training; of that number over four-fifths have had only special courses or in-service training. Of the remaining 5 percent of the total that have graduate public health training, three-fifths have less than 1 year's training and only 2 percent of the total have 1 year or more. Among sanitation employees the relative number of individuals with certificates or degrees is lower than in any other class of personnel, including laboratory workers.

TABLE 5.—*Levels of public health training reported by sanitation personnel, distributions by level of training and employment status*

Public health training reported	All sanitation personnel	State	County	City	Directors	Sanitary engineers	Staff
	Number						
Total	4,341	977	1,203	2,161	466	481	3,394
None	3,081	743	633	1,705	314	289	2,478
Special courses only	1,031	151	450	430	128	99	804
Less than 1 year	128	35	81	12	5	45	78
One year or more	101	48	39	14	19	48	34
Certificate or degree	90	38	42	10	17	38	35
	Percentage						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
None	71.0	76.0	52.6	78.9	67.4	60.1	73.0
Special courses only	23.8	15.5	37.4	19.9	27.5	20.6	23.7
Less than 1 year	2.9	3.6	6.8	.5	1.0	9.3	2.3
One year or more	2.3	4.9	3.2	.7	4.1	10.0	1.0
Certificate or degree	2.1	3.9	3.5	.5	3.6	7.9	1.0

There has been little change in the public health training level of sanitation personnel in the last 10 years. The White House Conference [11] studied 982 sanitarians in 1930 and found that 2.5 percent had as much as 1 year of public health training. It is significant, however, that the Conference found only 12 percent that had had any public health training. Thus, it will be seen that while the proportion having some public health training has increased, the proportion achieving the standard recommended by the Conference of State and Territorial Health Officers has not.

Sanitary engineers report more public health training than any other group, but even so, only 10 percent have had a year or more of training. However, when it is recalled that much of their professional training is in the sanitary sciences, their apparent lack of public health training becomes of much less significance than it is in the other

[11] Op. cit., pp. 264 and 275.

groups. City workers, however, are as poorly trained in public health as they are in other respects. Four-fifths of the city employees have had no public health training and only 26 individuals, or 1 percent of the 2,100, have had any except in-service or special-course public health training. Only 10 city sanitarians have certificates or degrees.

Among the 90 certificates and degrees with public health majors reported there are 2 doctorates of philosophy, 2 doctorates of public health, 49 master's degrees, 1 diploma, and 1 bachelor of science. The remaining 35 are certificates. It has been previously pointed out that requirements vary among institutions and that it cannot be assumed that every certificate reported is based on a year or more of training. Although very few of the sanitarians report specific work in public health, their qualifications may be somewhat better than would appear, inasmuch as most of those with academic or professional training report science majors.

Despite the possible educational qualifications obtained through professional and science courses, there is a serious training problem among sanitation personnel as a whole, inasmuch as its leaders are largely untrained in public health. Fewer than 5 percent of the directors of sanitation bureaus meet the standards suggested by the Conference of State and Territorial Health Officers. The sanitary engineers make a somewhat better showing, but only 1 percent of staff sanitarians have had the amount of public health training suggested by the Conference.

TABLE 6.—*Comparison of percentage distributions of sanitation personnel by recency of employment and levels of public health training*

Sanitation personnel groups	Public health training level reported			
	None	Special courses	Less than 1 year	1 year or more
All groups	71 0	23 8	2 9	2 3
Old employees [1]	75.0	22.6	.9	1.5
New employees [2]	62 8	26 1	7 1	4.0
State employees	76 0	15 5	3 6	4.9
Old employees	82 3	12.5	1.3	3.9
New employees	65 6	20 4	7.4	6.6
County employees	52 6	37 4	6.8	3.2
Old employees	60.1	35.6	2.2	2.1
New employees	46 5	38.9	10.4	4.2
City employees	78 9	19 9	.5	.7
Old employees	77.0	22.1	.4	.5
New employees	87.0	10.2	1.5	1.3

[1] Employed prior to 1935.
[2] Employed in or subsequent to 1935.

As has been pointed out in the previous papers in this series, funds were made available for the training of public health employees with the passage of the Social Security Act, and recommendations as to qualifications for employment have been made by the Conference of

State and Territorial Health Officers. If these two actions have had any effect, one would expect newly appointed employees to be better trained than those employed continuously in their present jurisdictions longer than the Act has been in effect. Although the number of trained sanitation workers is still relatively small, there is some evidence in table 6 that progress has been made since 1935.

There is a smaller proportion of untrained workers and a larger proportion with at least 1 year of public health training among new employees than among the older ones in both States and counties. It is significant, however, that among recent appointees in cities, there is a higher percentage of untrained workers than among older employees. City health departments not only have the poorest trained staffs but are making the least progress in improving the situation.

If levels of public health training among the several personnel groups are analyzed by age, an additional evidence of progess is found. Table 7, showing percentages of age groups with specified training, reveals that in State and county departments the proportion of untrained workers under 35 years old is considerably less than the proportion of untrained workers over 50. Similarly, more young workers than old ones have had formal public health training. In the State and county health departments, therefore, the tendency to fill vacancies with trained men will in the course of time raise the general level of training; but, as has repeatedly been pointed out, there is no such tendency evident in cities.

TABLE 7.—*Percentage distribution of sanitation personnel by age and training in public health, percentages of age groups with specified training*

Age	Employing jurisdiction and training reported											
	State				County				City			
	None	Special courses only	Under 1 year	1 year or more	None	Special courses only	Under 1 year	1 year or more	None	Special courses only	Under 1 year	1 year or more
All ages	76.0	15.5	3.6	4.9	52.6	37.4	6.8	3.2	78.9	19.9	0.5	0.7
Under 25	55.9	29.4	8.8	5.9	43.4	42.1	10.5	4.0	92.9	7.1		
25-29	62.1	19.6	9.8	8.5	38.6	42.3	11.4	7.7	82.4	14.8	2.8	
30-34	67.7	18.5	6.4	7.4	41.8	43.6	11.8	2.8	73.4	22.5	1.7	2.4
35-39	75.0	20.6	.7	3.7	50.6	45.5	3.9		76.1	23.9		
40-44	82.1	10.0	2.4	5.5	54.9	38.2	4.2	2.7	74.5	23.7	.6	1.2
45-49	83.1	12.9	.8	3.2	65.5	31.5	1.5	1.5	73.8	25.4	.2	6
50-54	88.6	9.5		1.9	78.3	18.8	2.9		80.9	18.2	.3	.6
55-59	89.1	10.9			75.4	24.6			82.9	16.7	.4	
60 or over	93.0	7.0			82.5	15.9	1.6		85.3	13.9	.3	.5
Unknown	100.0				66.7	22.2		11.1	88.9	11.1		

EMPLOYMENT EXPERIENCE OF SANITATION WORKERS

The questionnaire by means of which the data in this survey were collected, requested, in addition to the information on training already presented, the following items about present and past employment: (*a*) The title of each position held, (*b*) name and address

of each employing organization, (*c*) the number of years each position was held and whether it was full- or part-time, and (*d*) the type of organization by whom the individual was employed. The analysis of experience history that follows is therefore limited to employment as reported by the sanitarians themselves. In this, as in the previous papers, no assumptions are made regarding periods of unemployment which may not have been reported.

Types of experience.—It is generally recognized that, except for sanitary engineers and veterinarians, there is no common professional group from which other sanitation personnel are recruited. It is not surprising, therefore, to find their reported occupational experience widely varied. The more frequently mentioned occupations and the number of workers with experience in them are shown in table 8. Although 70 percent of the group have worked out of the field of public health, no single type of experience was reported in more than 12 percent of the cases. Engineering, sales and office work are the three types of experience most frequently mentioned.

TABLE 8.—*Types of experience reported by sanitation personnel*

Types of experience reported	All sanitation personnel	State	County	City	Directors	Sanitary engineers	Staff
	Number						
Total	4,341	977	1,203	2,161	466	481	3,394
Public health only	1,303	245	382	676	142	116	1,045
Other than public health [1]	3,038	732	821	1,485	324	365	2,349
Engineer [2]	420	211	153	56	61	229	130
Dairy inspector	238	47	63	128	58	4	176
Plumber or steamfitter	163	10	28	125	24	3	136
Sales work	443	74	140	220	28	19	396
Office work	515	138	114	263	38	29	448
Factory work	176	31	43	102	16	8	152
Farming	154	21	59	74	13	5	136
Bacteriologist or pharmacist	162	64	45	53	13	22	127
Veterinarian	214	15	50	149	25	4	185
Miscellaneous—other	1,413	345	419	649	180	165	1,068
	Percentage						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Public health only	30.0	25.1	31.8	31.3	30.5	24.1	30.8
Other than public health [1]	70.0	74.9	68.2	68.7	69.5	75.9	69.2
Engineer [2]	9.7	21.6	12.7	2.6	13.1	47.6	3.8
Dairy inspector	5.5	4.8	5.2	5.9	12.4	.8	5.2
Plumber or steamfitter	3.8	1.0	2.3	5.8	5.2	.6	4.0
Sales work	10.2	7.6	11.6	10.6	6.0	4.0	11.7
Office work	11.9	14.1	9.5	12.2	8.2	6.0	13.2
Factory work	4.1	3.2	3.6	4.7	3.4	1.7	4.5
Farming	3.5	2.1	4.9	3.4	2.8	1.0	4.0
Bacteriologist or pharmacist	3.7	6.6	3.7	2.5	2.8	4.6	3.7
Veterinarian	4.9	1.5	4.2	6.9	5.4	.8	5.5
Miscellaneous—other	32.6	35.3	34.8	30.0	38.6	34.3	31.5

[1] Combinations of experience are not shown but numbers and percentages are shown for each type of experience reported.
[2] Not including experience as sanitary engineer.

In relatively few of the categories listed in table 8 is there any obvious relationship between prior experience and present employment. Furthermore, jurisdictional differences and those between functional groups are most striking. For example, although fewer than 10 percent of all sanitation personnel report previous engineering experience, almost one-half the sanitary engineers and one-fifth of State employees have had it. Relatively 8 times as many State employees as city employees have had such experience. Granting that small groups have had experience that might be good preparation for their present employment, sanitation personnel as a class have not. Sanitation corps staffs frequently come from occupations which could hardly be expected to contribute to their success in the corps.

Public health experience.—Sanitation workers report on the average longer experience in public health than either physicians or nurses. Their average experience is 9.9 years in public health as compared with 8.2 years for physicians and 9.0 years for nurses. This is about 1 year longer than the average experience found in the White House Conference Survey in 1930.[12]

Jurisdictional differences in length of service are shown in table 9, in which it will be seen that city employees have an average of 12.3 years' service, a much longer public health experience than those from States (9.0 years) or counties (6.2 years). The city employees' length of service is exceeded only by that of sanitation directors who average 13.7 years in the field. County employees and sanitary engineers, the youngest groups, have had the shortest average experience, 6.2 and 6.4 years, respectively. This difference is to be expected since expansion, chiefly in county and State units, has only recently brought the younger men into public health.

The relatively long employment in public health shown in table 9 might be considered to compensate for the limited amount of public health training shown earlier. However, it should be pointed out that the only experience of approximately 20 percent of the sanitation workers is their present public health job. Furthermore, another 50 percent have had only one position, the present one, in public health, even though they have had other employment. Thus, only 30 percent of the currently employed sanitarians have broadened their understanding of public health through employment in a number of situations. Distributions of the number of periods of public health employment for the administrative and jurisdictional groups are shown in table 10. Both the State and the county personnel have had greater variety in their experience than the city workers, 80 percent of whom have had only their present public health job. The directors have had a broader experience than any other group.

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[12] Op. cit., p. 275.

TABLE 9.—*Length of public health experience among sanitation personnel by employment status*

Number of years of public health[1] experience reported	All sanitation personnel	State	County	City	Directors	Sanitary engineers	Staff
	Number						
Total	4,341	977	1,203	2,161	466	481	3,394
Under 5	1,743	441	737	565	118	293	1,332
5-9	743	178	196	369	60	76	607
10-14	835	139	170	526	91	59	685
15-19	475	121	66	288	76	35	364
20-24	271	57	22	192	58	14	199
25-29	171	28	7	136	38	4	129
30 or more	103	13	5	85	25	----------	78
Average (years)	9.9	9.0	6.2	12.3	13.7	6.4	9.8
	Percentage						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 5	40.2	45.2	61.3	26.2	25.3	60.9	39.2
5-9	17.1	18.2	16.3	17.1	12.9	15.8	17.9
10-14	19.2	14.2	14.1	24.3	19.5	12.3	20.2
15-19	10.9	12.4	5.5	13.3	16.3	7.3	10.7
20-24	6.3	5.8	1.8	8.9	12.4	2.9	5.9
25-29	3.9	2.9	.6	6.3	8.2	.8	3.8
30 or more	2.4	1.3	.4	3.9	5.4	----------	2.3

[1] Includes those who reported only one position (present position) in public health.

TABLE 10.—*Periods of public health employment reported by sanitation personnel, by number of periods, and employment status*

Number of periods of public health employment reported	All sanitation personnel	State	County	City	Directors	Sanitary engineers	Staff
	Number						
Total	4,341	977	1,203	2,161	466	481	3,394
1[1]	3,071	588	751	1,732	183	250	2,638
2	736	196	263	277	140	120	476
3	301	103	106	92	79	57	165
4	127	48	44	35	29	33	65
5 or more	106	42	39	25	35	21	50
Average (periods)	1.5	1.7	1.6	1.3	2.1	1.9	1.4
	Percentage						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1[1]	70.7	60.2	62.4	80.1	39.3	52.0	77.7
2	17.0	20.1	21.9	12.8	30.0	24.9	14.0
3	6.9	10.5	8.8	4.3	17.0	11.9	4.9
4	2.9	4.9	3.7	1.6	6.2	6.9	1.9
5 or more	2.5	4.3	3.2	1.2	7.5	4.3	1.5

[1] Includes those reporting only present position.

The limited range of experience is further emphasized by a tabulation of the number who have worked in more than one State. The experience of 95 percent of the total and 97 percent of the staff workers has been restricted to one State. More sanitary engineers than directors or staff workers have had experience in two or more States, although the proportion even in this group is only one out of six. Among the jurisdictional groupings, city employees, with the longest public health employment, are also the most limited in variety of experience since only 2 percent of them have worked in more than one State. For the State and the county workers the percentages are 10 and 7, respectively.

Still another indication of the limited public health experience of sanitation workers is the very small number who have worked in other agencies, such as nonofficial health agencies. About 12 percent of the total have served in the United States Public Health Service, Army or Navy, or voluntary health agencies. Two-thirds of this experience was in the Army or Navy and was gained by the older sanitarians at about the time of the World War. It is doubtful whether much of their experience in the armed forces was of a public health nature. The greatest number reporting such service is found among staff sanitarians, especially those in cities.

Stability of employment in public health.—All the previous evidence points to the fact that employment in sanitary corps is quite stable. It should be borne in mind that almost three-fourths of the workers have had public health experience only in the position they are now occupying, and that the average length of their public health employment is greater than that of physicians or nurses. Since so few sanitarians have had other public health positions, the length of their present employment would naturally approximate their total public health experience. In fact, the average length of present employment differs from that of total public health experience by less than 1 year for every group except directors, for whom the difference is only slightly over a year. A further index of stability, the number of positions in other fields after the first employment in public health, likewise reveals very stable employment.

More than 93 percent of the sanitation personnel now in service have worked continuously in the field ever since entering it. Even among those who have had at least one period of employment in a different field after an initial employment in public health, the average of such "interruptions" is 2 periods per individual (see table 11). State employees, sanitation directors, and sanitary engineers are the only classes in which as many as 9 percent have had any interruption to their service in public health.

TABLE 11.—*Employment in other fields after initial employment in public health, as reported by sanitation personnel*

Number of periods of employment in other fields after first period in public health	All sanitation personnel	State	County	City	Directors	Sanitary engineers	Staff
	Number						
Total	4,341	977	1,203	2,161	466	481	3,394
None	4,053	888	1,110	2,055	416	427	3,210
1	152	51	44	57	30	34	88
2	53	15	20	18	8	8	37
3	40	14	13	13	6	8	26
4	18	3	5	10	2	1	15
5 or more	25	6	11	8	4	3	18
Average number of periods of employment in other fields (for those having any such employment)	2.0	1.9	2.1	2.0	1.8	1.7	2.1
	Percentage						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
None	93.4	90.9	92.3	95.1	89.3	88.7	94.6
1	3.5	5.2	3.6	2.6	6.4	7.1	2.6
2	1.2	1.6	1.7	.8	1.7	1.7	1.1
3	.9	1.4	1.1	.6	1.3	1.7	.8
4	.4	.3	.4	.5	.4	.2	.4
5 or more	.6	.6	.9	.4	.9	.6	.5

Although from the standpoint of the worker, stability of employment, such as has been described for sanitation personnel, makes the position a desirable one to hold, it is still probable that opportunity for promotion or change of position is even more desirable to stimulate an alert worker to advancement. From the administrator's point of view the position of the sanitarian is perhaps too stable, and as a result, professional stagnation seems to be taking place.

SUMMARY AND DISCUSSION

1. Sanitation personnel make up about one-fourth of all full-time health department employees. Out of each 9 sanitation employees, 7 are staff sanitarians, 1 is a sanitation director, and 1 is a sanitary engineer. Over half the sanitary engineers work for State health departments; over half the staff sanitarians work for cities.

2. There is wide variation in the age levels of sanitation workers, the only professional group whose staff employees are older than their supervisors. Among the jurisdictional groups, city sanitarians are the oldest, those from counties the youngest.

3. Sanitary engineers as a class are, in every respect, more thoroughly trained than their directors and both groups far surpass staff sanitarians in educational background. Ninety percent of sanitary engineers have at least 4 years of training beyond high school and about the same proportion have academic or professional degrees.

The only important jurisdictional contrast in the academic and professional training of sanitarians is that city employees as a group fall below those from either States or counties at every point on the scale.

4. Sanitation workers have had less public health training than either physicians or nurses. Only 5 percent have had any graduate public health training; only about 2½ percent have had as much as a year. One in 20 State employees and one in 10 sanitary engineers has the public health qualifications recommended by the Conference of State and Territorial Health Officers.

5. Analysis of public health training by age and recency of employment shows some improvement in the quality of personnel recently employed, except in city departments where the youngest employees have less training than any other age group. The Social Security Act has apparently operated to supplement the training of relatively small numbers of State and county sanitation workers.

6. It is apparent from the employment experience reported that there is a high degree of job security in sanitary corps. Workers are, however, recruited from no particular professional or other occupational group, and in most cases come into public health with little or no experience or specialized training that might guide them in their duties.

7. Tenure in the sanitary corps seems to be longer than in other professional groups studied, especially in city departments, whose employees have an average experience of more than 12 years. Sanitation directors as a group have an even longer average tenure (almost 14 years) in the field.

8. Over 70 percent of all sanitarians and 80 percent of the city employees have had only one job in the field of public health.

9. Breadth of experience from working in different States, for other agencies, or at different sorts of positions in public health is only rarely found among sanitation personnel. It is apparently not difficult to hold a position once it is gained; but advancement seems unlikely for the majority of the group.

STUDIES ON ACTIVE AND PASSIVE IMMUNITY IN "Q" FEVER INFECTED AND IMMUNIZED GUINEA PIGS [1]

By Ida A. Bengtson, *Senior Bacteriologist, United States Public Health Service*

The occurrence of "Q" fever among meat workers and dairy farmers, first reported by Derrick in 1937 (*1*), and the recent occurrence of cases of pneumonitis caused by the virus of "Q" fever among employees of the National Institute of Health (*2*), suggesting the possibility of a relationship with certain other outbreaks of pneumonitis de-

[1] From the Division of Infectious Diseases, National Institute of Health.

scribed in the literature, emphasize the importance of immunological studies. This is particularly true in the matter of diagnosis, since the disease may be confused with other rickettsial diseases or other diseases of virus or bacterial origin. Derrick states that the outstanding symptoms are fever and headache. This also describes the symptoms of most of the cases among employees of the National Institute of Health. These symptoms also characterize cases of mild endemic typhus in which the rash may be so slight as to be overlooked.

Burnet and Freeman (*3*) found that sera from convalescent patients protected laboratory animals against the disease. In our series neutralizing antibodies were also shown to be present in convalescent sera, although results were not complete (*2*). Agglutination of "Q" fever antigen by convalescent sera was demonstrated in the majority of our cases, the sera having been drawn 24 days to 55 days after the onset of illness (*2*). The possibility of early diagnosis by complement fixation should be considered. Whether the virus neutralizing properties of convalescent serum run parallel with the agglutinating and complement fixing antibodies is a question of importance. Bedson (*4*), in a study of psittacosis antibodies, demonstrates that the agglutinins and complement fixing antibodies are present in hyperimmune serum although the virus neutralizing antibodies are very weak. Also convalescent sera fixed complement though neutralizing antibody could not be detected. In certain other virus diseases, the neutralizing antibody is in evidence at the same time or earlier than the complement fixing or agglutinating antibodies.

EXPERIMENTAL

In this study, information which might have a bearing on the aspects of active and passive immunity in "Q" fever was sought in experiments on guinea pigs, using vaccines prepared from rickettsiae cultivated in various ways and immune sera obtained by injecting rabbits and guinea pigs with killed and living cultures of rickettsiae. The strains used were the "X" strain (*5*) and the "M" strain (*2*) of the National Institute of Health.

Methods of cultivation of rickettsiae.—The study involved an investigation of the methods most suitable for obtaining the largest numbers of rickettsiae. For this purpose both the methods of Cox (*7*), who has used infected yolk sac, and those of Burnet and Freeman (*3*), who have used infected mouse spleen, have been employed, as well as a combination of these methods.

In both the mouse spleen and yolk sac cultivation there is a period of adaptation before maximum multiplication is obtained when guinea pig material is used as the initial inoculum. In the yolk sac method this is indicated by the relatively long incubation period

necessary before the virus kills the embryo in the first passage. This incubation period is also dependent on the strength of the virus used for initiating growth in the chick embryo. A longer incubation was required with citrated or defibrinated blood than with spleen or liver. With blood it might vary from 10 to 12 days, while with infected spleen it was usually 7 to 8 days or occasionally 9 or 10 days. The titer of both could be increased and the incubation period shortened most rapidly by making transfer around the time when it was evident that deaths were resulting from the effect of the virus as indicated by candling. With spleen inoculum, the incubation period was usually shortened to 5 or 6 days and after 3 or 4 further passages it was decreased to 4 days and occasionally to 3 days. However, there was considerable fluctuation. Apparently the rickettsiae are most numerous just before the death of the embryo, but the impracticability of determining this accurately sometimes prevents transfer at the optimum time. When tranfers are made much before the optimum time they have the effect of increasing the incubation period and reducing the titers of the infected material. However, titers of 1×10^{-9} or over were usually obtained very regularly after the first few transfers.

A similar adaptation of guinea pig virus to the mouse was observed. Microscopic examination of spleen and liver for the presence of rickettsiae revealed few rickettsiae in the first passage. The rickettsiae were increased in the second passage and usually became very numerous in the third or fourth passages, although, as in the case of the chick embryos, the titer of the infected spleen sometimes underwent fluctuations, as transfer could not be made at the optimum time. Occasionally the number of rickettsiae diminished in later passages. It is possible that by recording temperatures of mice the optimum time of transfer might be determined and the number of rickettsiae maintained at approximately the same levels.

Increase in virulence for mice and guinea pigs by yolk sac passage.—In the routine passage of "Q" fever strains in guinea pigs by transfer of the blood of an infected guinea pig on the second or third day of fever, the usual course of the disease is indicated by elevation of temperature, beginning on the fourth or fifth day and continuing for from 3 to 8 days. This is then followed by a drop in temperature and apparent recovery. In mice also, after the virus has become established following the original inoculum of guinea pig spleen or blood, and routine transfers are made with 10 percent suspensions of infected mouse spleens, the mice appear healthy and no deaths occur.

If, however, 10 percent suspensions of infected yolk sac are used for the inoculation of mice and guinea pigs, particularly after 3 or 4 passages in chick embryos when the titer has reached 1×10^{-9} or over,

there was evidence of much higher virulence. This was more marked if infected guinea pig spleen was used as original inoculum into the yolks rather than infected guinea pig blood.

When the inoculum into the guinea pig was 1×10^{-1} dilution of yolk sac, elevation of temperature to 40° C. or over usually occurred on the following day, sometimes on the second day, and occasionally on the third day following inoculation. The number of days of elevated temperature varied from 2 to 6, followed by death in practically all cases in 4 to 7 days. The spleens and livers showed high concentrations of rickettsiae. With 1×10^{-2} dilutions of yolk sac which reached a titer of 1×10^{-9}, the inoculated guinea pigs showed elevated temperatures sometimes on the day following inoculation or on the second, third, or fourth day, usually followed by death on the fifth to the twelfth day. Early rise in temperature also occurred with 1×10^{-3} or occasionally higher dilutions, also often followed by death on the seventh to the seventeenth day.. There were also deaths with dilutions 1×10^{-4}, 1×10^{-5}, and 1×10^{-6}, and occasionally with higher dilutions.

Spleens from guinea pigs inoculated with high titer yolk sac, when titrated in other guinea pigs, were infective in dilutions up to 1×10^{-9} and 1×10^{-10}. Such spleens also caused death of guinea pigs when injected in dilutions of 1×10^{-1} and sometimes up to 1×10^{-3}. In contrast, spleens from guinea pigs injected with blood for routine passage were found to be infective in dilutions of 1×10^{-5} and 1×10^{-6}.

When high titer yolk sac was used for inoculating mice, symptoms of roughened fur, inactivity, and a generally ill appearance developed, in some cases followed by death. The spleens of these mice were highly virulent, sometimes reaching a titer of 1×10^{-11} and killing guinea pigs with dilutions of 1×10^{-1}, 1×10^{-2}, or even higher.

In routine passage in mice by infected mouse spleen, when the initial inoculum had been guinea pig spleen, a titer of 1×10^{-9} was reached after three or four passages at weekly intervals.

Distribution of rickettsiae in mice and guinea pigs.—As a rule rickettsiae were more numerous in the spleens of infected mice than they were in the livers, but when they were more numerous than usual in the spleens they were correspondingly more numerous in the livers and occasionally they appeared as numerous in the livers as in the spleens. Likewise, the more numerous the rickettsiae were in the spleens, the more likely were they to be found in the lungs, although they were never as numerous in the latter location following intraperitoneal inoculation, the usual method employed, as they were in the livers.

The protocol given in table 1 indicates the results obtained in a series of mice inoculated intraperitoneally with 0.5 cc. of a 10 percent

suspension of infected yolk sac in the sixth passage on the fourth day after inoculation into the yolk.

TABLE 1.—*Rickettsiae in mice inoculated with infected yolk sac*

Mouse No.	Rickettsiae (after 12 days)			Mouse No.	Rickettsiae (after 12 days)		
	Spleen	Liver	Lungs		Spleen	Liver	Lungs
1	(1)			7	(1)		
2	+++	++	+	8	(1)		
3	+++	++	±	9	(1)		
4	+++	++	±	10	+++	++	+
5	+++	+++	±	11	++	++	±
6	+++	+++	++	12	+++	+++	++

[1] Died in 10 days

Likewise, guinea pigs inoculated intraperitoneally with 1 cc. of a 10 percent suspension of infected yolk sac at times had almost as many rickettsiae in the livers as in the spleens. The protocol shown in table 2 is an illustration of the temperature reactions and also indicates the relative numbers of rickettsiae.

TABLE 2.—*Rickettsiae in guinea pigs inoculated with infected yolk sac*

Guinea pig No.	Temperature elevation, days following inoculation				Rickettsiae (5th day)		Guinea pig No.	Temperature elevation, days following inoculation				Rickettsiae (5th day)	
	1	2	3	4	Spleen	Liver		1	2	3	4	Spleen	Liver
12	40.7	41.0		40.4	+++	++	14	40.2	41.2		40.7	+	++
13	41.4	41.2		40.8	+	±	15	40.8	41.0		41.0	+	±

The spleens and livers of infected mice and guinea pigs when showing ++ and +++ rickettsiae offer the advantage of a larger quantity of infected tissue than the yolk sac affords. In particular, if infection showing this many rickettsiae in guinea pig spleen occurs then a very large number of rickettsiae may be recovered, since this organ may weigh 3 to 4 grams. Spleens from 8 guinea pigs averaged 3.4 grams and the livers 28 grams. Spleens from 100 mice averaged 0.35 gram and the livers 1.5 grams.

PREPARATION OF VACCINES AND SUSPENSIONS OF RICKETTSIAE FOR IMMUNIZATION PURPOSES

Infected yolk sacs and infected mouse spleens and livers, as well as guinea pig spleens, were employed in the preparation of a number of vaccines and suspensions which were used for the immunization of guinea pigs and rabbits and also in agglutination tests. The mouse and guinea pig tissues were preferred to the yolk sacs on account of the greater ease of manipulation, less difficulty being experienced in freeing the rickettsiae from extraneous tissue.

A 10 percent suspension by weight in sterile buffered 0.85 percent saline adjusted to pH 7.0 was prepared after first macerating the tissue in a mortar with alundum or grinding in an electrically operated mixer without alundum. Phenol was added in the ratio of 1 percent and the formalin in 0.5 percent. These suspensions were allowed to stand at ice-box temperature for varying periods of time. The heavier particles were precipitated by light centrifugation for 5 minutes. The supernatant fluid was then centrifuged at high speed (3,500 r. p. m. for 1¼ hours in the horizontal centrifuge or 5,000 r. p. m. for 30 minutes in an angle centrifuge). The precipitate was resuspended in sterile saline and again centrifuged lightly to precipitate the larger particles, the greater number of rickettsiae being present in the supernatant fluid. The precipitate was extracted several times by further addition of sterile saline followed by light centrifugation and additional rickettsiae were thus obtained. The final volume of the suspension of rickettsiae was equal to that of the original 10 percent suspension or was more concentrated. If it was desired to obtain suspensions as free of tissue as possible, the method of Léon as previously described (*8*) was used, or if a suspension relatively free from tissue was desired, this could be obtained by allowing the suspension to stand at ice-box temperature for a week or longer, when the greater part of the tissue would be precipitated as a brownish deposit. Phenol in the ratio of 0.4 percent and formalin in 0.1 percent were added as preservatives in the suspensions used as vaccines, and in those used as antigens in agglutination tests merthiolate was added to a dilution of 1:10,000.

Results in guinea pigs.—For the preparation of vaccine D infected mouse spleens and livers (strain "X") from mice showing ++ and +++ rickettsiae in both spleens and livers were employed. A titration of the spleen of one mouse showed that it was infective in guinea pigs in a dilution of 1×10^{-9}. This vaccine was prepared as described and treated with 0.4 percent phenol and 0.1 percent formalin. Guinea pigs were given two subcutaneous inoculations, a week apart, of 1 cc. of the following concentrations: 2½ percent, 5 percent, 10 percent, and 20 percent, based on the weight of tissue from which the vaccine was prepared.

Figures 1 and 2 show the results obtained on testing for immunity. Half of the animals were tested with infected guinea pig spleen on the eighteenth day following the inoculation of the vaccine. The remainder were tested with infected yolk sac on the twenty-third day following the administration of the vaccine.

Spleens from guinea pigs infected with the "X" and the "M" strains of "Q" fever were used in parallel tests to determine immunity, using 10 percent suspensions of the spleens. With one exception, there was complete immunity throughout, the results being as favorable with the 2½ percent suspension as with the 20 percent. (See

fig. 1.) No titration was made of the infected spleen used in testing for immunity, but all control animals inoculated with the 10 percent suspension showed typical temperature reactions.

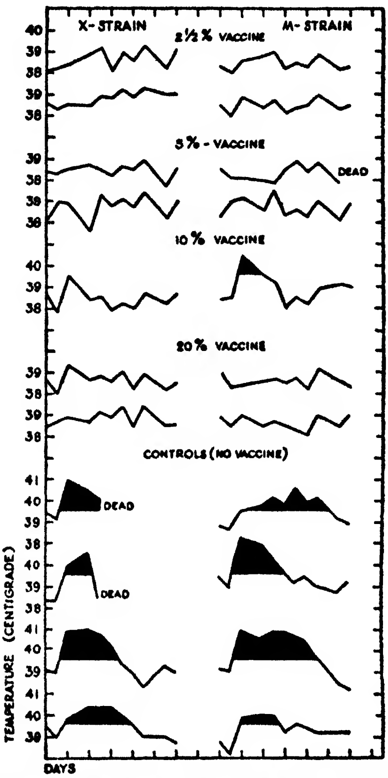

FIGURE 1.—Vaccine D. Test for active immunity in vaccinated guinea pigs using infected guinea pig spleen suspensions of the "X" and "M" strains.

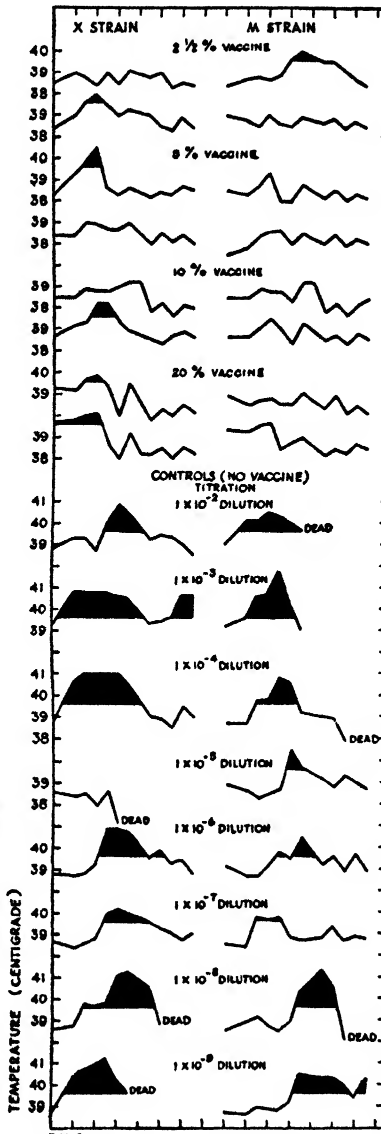

FIGURE 2.—Vaccine D. Test for active immunity in vaccinated guinea pigs using infected yolk sac suspensions of the "X" and "M" strains.

The results obtained in the series tested for immunity with infected yolk sac (1×10^{-2} dilution) are shown in figure 2. As in the other series, tests were made with yolk sacs infected with both the "X" and

the "M" strains of "Q" fever. Practically complete protection was afforded against the "M" strain (slight elevation of temperature in one animal which had received the 2½ percent suspension). Protection against the "X" strain was not as clear cut, though in nearly all cases one animal of each pair was completely protected.

In one animal which had received the 20 percent vaccine the rise in temperature at the beginning indicated a secondary infection. In the others showing temperature elevations this occurred for 1 or 2 days and the significance is questionable.

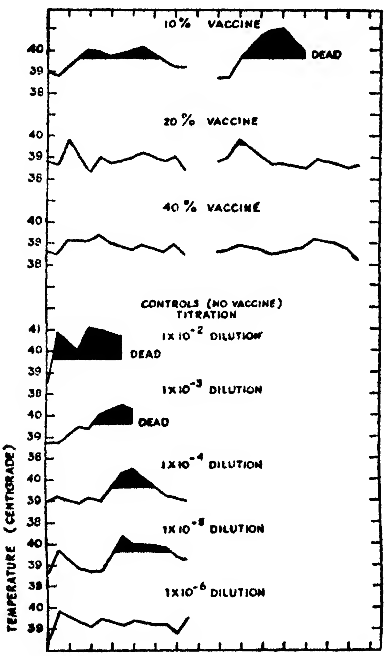

FIGURE 3.—Vaccine XXII. Test for active immunity in vaccinated guinea pigs using infected guinea pig spleen suspension of the "X" strain. Two inoculations of vaccine.

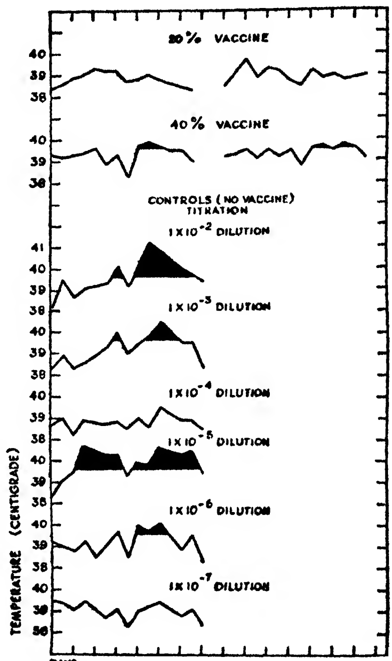

FIGURE 4.—Vaccine XXII. Test for active immunity in vaccinated guinea pigs using infected guinea pig spleen suspension of the "X" strain. One inoculation of vaccine.

Titration of both the "X" strain and the "M" strain showed that they were infectious in dilutions of 1×10^{-9}. The vaccines were, therefore, effective against 10,000,000 infective doses.

Another vaccine (XXII) was prepared from infected mouse livers. Although rickettsiae were recorded as ++ and +++ in the spleens of these mice, in the liver they were recorded as + or less. The method of preparation was similar to that described for vaccine D, the total volume of the 10 percent suspension being 470 cc. (livers from 23 mice). After centrifugation of the crude suspension, the precipitated rickettsiae were suspended in one-eighth the original volume (i.e., 59 cc.) of buffered saline solution (pH 7.0) and the tissue

precipitated and removed as previously described. For the tests in guinea pigs the vaccine was diluted one-half, one-quarter, and one-eighth, corresponding to 40 percent, 20 percent, and 10 percent of the original material.

Guinea pigs received either 1 or 2 subcutaneous inoculations of 1 cc. each of the 3 different concentrations. Tests for immunity were made approximately 2 weeks after the last inoculation, using 10 percent suspensions of guinea pig spleens. The results are shown in figures 3 and 4, figure 3 showing the results obtained with two inoculations of vaccine and figure 4, the results following one inoculation of vaccine. Practically complete protection was afforded by the 20 and 40 percent concentrations of vaccine following two inoculations, but the 10 percent concentration definitely failed to protect against 1 cc. of 1×10^{-1} suspension of "X" strain infected guinea pig spleen. There was no elevation of temperature with the 40 percent vaccine and a very slight elevation for one day with the 20 percent concentration. On titration this spleen was infective in 1×10^{-5} dilution. Protection was, therefore, afforded against 10,000 minimal infectious doses.

The guinea pigs receiving one inoculation of the 20 percent vaccine were completely protected against 1 cc. of a 1×10^{-1} dilution of "X" strain infected guinea pig spleen and those receiving the 40 percent concentration, though showing very slight elevation of temperature for 1 or 2 days, were probably also protected against the same amount of infected guinea pig spleen. A titration of the spleen material used for testing the immunity of the vaccinated animals indicates infection in a dilution of 1×10^{-6}. Protection was, therefore, afforded against 100,000 minimal infectious doses.

The results with another vaccine (XXI) made from mouse spleens tested in guinea pigs are summarized in table 3.

TABLE 3.—*Results of immunity test in guinea pigs receiving one and two inoculations of vaccine XXI made from mouse spleen*

Concentration, percent	Number of guinea pigs inoculated	Number of inoculations	Results of immunity test		Concentration, percent	Number of guinea pigs inoculated	Number of inoculations	Results of immunity test	
2½	2	2	I	I	10	2	1	I	D
	2	1	I	I	20	2	2	I	I
5	2	2	I	I		2	1	I	I
	2	1	I	D					

I=Immune. D=Died.

The titer of infected guinea pig spleen used for immunity test was 1×10^{-6}, the inoculum in the immunity test being a 1×10^{-1} dilution of spleen. Therefore, protection was afforded against 100,000 minimal infective doses. One inoculation of the 2½ percent vaccine was apparently as effective in protecting against this amount of virus as

were two inoculations of the 20 percent material. The spleens from which this vaccine was prepared were infective for guinea pigs in 1×10^{-9} dilution or less. One cc. of the 2½ percent suspension, therefore, contained 25,000,000 or more rickettsiae, indicating good antigenicity.

Vaccines were prepared from infected yolk sac which on titration was shown to be infective in a dilution of 1×10^{-9}. In testing for immunity the vaccinated animals were inoculated intraperitoneally with 1 cc. of a 1×10^{-1} dilution of infected guinea pig spleen 2 weeks after the last inoculation. The results with the yolk sac vaccine are shown in table 4.

TABLE 4.—*Results of immunity test in guinea pigs receiving one and two inoculations of vaccine.*

Concentration, percent	Number of guinea pigs inoculated	Number of inoculations	Results of immunity test		Concentration, percent	Number of guinea pigs inoculated	Number of inoculations	Results of immunity test	
2½	2	2	NI	NI	10	2	2	I	I
	2	1	NI	D		2	1	NI	NI
5	2	2	I	D					
	2	1	NI	NI					

NI=None immune. I=Immune. D=Died.

The results obtained with the yolk sac vaccine show that two inoculations of the 5 percent and 10 percent concentrations afforded immunity against the test dose of infected guinea pig spleen used, while one inoculation failed to immunize. The 2½ percent vaccine was not effective with either one or two inoculations. It seems probable that the method used for separating tissue and rickettsiae was not as efficient as with the mouse tissues, since the original material was infective in a titer of 1×10^{-9}. It seems logical to assume that the efficiency of the vaccine is primarily dependent on the number of rickettsiae, although the presence of foreign tissue components may interfere with the response to the specific rickettsial antigen. Therefore, it is very probable that with purer suspensions as good results would be otained as with mouse infected tissue vaccines.

PASSIVE IMMUNITY IN GUINEA PIGS

Protection tests in animals are valuable in the diagnosis of disease and in the differentiation of diseases which have similar symptoms. Results with several convalescent sera from the series of cases occurring at the National Institute of Health showed that they had demonstrable virus neutralizing antibodies against the "M" strain in tests on guinea pigs (*2*). However, these tests were not entirely conclusive. In order to obtain further information on this subject, tests have been made with sera from experimentally infected guinea pigs and

from guinea pigs immunized by the inoculation of vaccines followed by living rickettsiae.

In testing for passive immunity varying amounts of immune sera (0.01, 0.02, 0.05, 0.1, 0.2, and 0.5 cc.) were mixed with a constant amount of infected guinea pig plasma (0.5 cc.) or spleen and liver suspension and allowed to stand at room temperature for one-half hour before being inoculated intraperitoneally into the animals under test.

In preparing the mixtures, the undiluted serum was measured in 0.5, 0.2, and 0.1 cc. amounts into conical glasses. Similarly 0.5, 0.2, and 0.1 cc. amounts of the serum diluted 1 : 10 with sterile 0.85 percent saline were measured into conical glasses. The volumes were then equalized to those containing 0.5 cc. by the addition of appropriate amounts of saline following which 0.5 cc. of the infectious material was added to each.

PREPARATION OF IMMUNE SERA

Guinea pigs.—Immune sera were obtained by several subcutaneous injections of guinea pigs with killed rickettsiae followed by living organisms. These suspensions were from mouse spleens in the case of the killed culture while the living cultures were from both mouse and guinea pig spleens. Bleedings were made from time to time and the serum tested for agglutinating properties. In table 5 are shown the results of an agglutination test with sera from guinea pigs after two subcutaneous inoculations of vaccine followed by three subcutaneous inoculations of suspensions of living rickettsiae.

TABLE 5.—*Results of agglutination test in guinea pigs after five inoculations*

Serum from guinea pig No.	1:10	1:20	1:40	1:80	1:160	1:320	1:640	1:1280
384	4	4	4	4	3	2	1	0
393	4	4	4	4	4	4	3	1
396	4	4	4	4	4	4	4	1

In table 6 is shown an agglutination test with several guinea pig sera after the above course of treatments and two additional inoculations of living rickettsiae.

TABLE 6.—*Results of agglutination tests after seven inoculations*

Serum from guinea pig No.	1:20	1:40	1:80	1:160	1:320	1:640	1:1280	1:2560	1:5120	1:10240
388	4	4	4	4	4	4	4	4	3	3
405	4	4	4	4	4	4	4	4	4	3
412	4	4	4	4	4	4	4	2	0	0

In the first test the animals were bled 10 days after the last inoculation of rickettsiae and in the second test 12 days after the last inoculation.

Rabbits.—Three rabbits which had previously received intravenously suspensions of killed rickettsiae (7, 12, and 18 inoculations) with titers not exceeding 1:640 were given three subcutaneous inoculations of suspensions of live rickettsiae at intervals of from 9 to 11 days, using 1 cc., 2 cc., and 4 cc. The results obtained in the agglutination test on bleeding 12 days after the last inoculation are shown in table 7.

TABLE 7.—*Results of agglutination test after intravenous and subcutaneous inoculations*

	1:20	1:40	1:80	1:160	1:320	1:640	1:1280	1:2560	1:5120	1:10240
NM1	4	4	4	4	4	4	4	4	3	2
NM2	4	4	4	4	4	4	4	4	3	2
Q	4	4	4	4	4	4	4	3	2	0

TESTS FOR PASSIVE IMMUNITY IN GUINEA PIGS WITH HYPERIMMUNE SERA

In figure 5 are shown the results of a test using immune guinea pig serum pooled from blood drawn from 7 guinea pigs which had received two inoculations of killed culture and five of living rickettsiae, and which were bled 12 days after the last inoculation. Tests were made in duplicate using plasma from a guinea pig inoculated with the "M" strain. With the exception of 1 or 2 days' elevation in temperature in 2 of the animals all dilutions of the immune serum, including the 0.01 cc. dose, protected against 0.5 cc. of the infected guinea pig plasma. Control animals without immune sera ran temperatures typical of "Q" fever.

Another similar test was carried out with the same hyperimmune serum against the "X" strain. There were certain irregularities in this test. While complete neutralization was indicated by no rise in temperature with the 0.2 cc. amount of serum and the 0.02 cc. and with one of the 0.01 cc. amounts, all others showed a slight delayed elevation in temperature. Apparently the late elevation of temperature is evidence of incomplete neutralization.

Figure 6 shows the results of another test using immune guinea pig serum pooled from blood drawn from 4 guinea pigs after 8 inoculations of killed and living suspensions of rickettsiae, the first 7 corresponding with those in the preceding test. This was followed in 19 days with an inoculation of a heavy suspension of killed culture. Twelve days afterwards the animals were bled. Plasma from a guinea pig infected with the "X" strain of "Q" fever was mixed with the various dilutions of immune sera, using the same dilutions

of the latter as in the previous test. In this test less protection was afforded and a "zone phenomenon" was in evidence, since there was less neutralization with 0.5 cc. and 0.2 cc. of immune sera than with smaller amounts, although the smallest amount used, 0.01 cc., was probably not sufficient to afford complete protection.

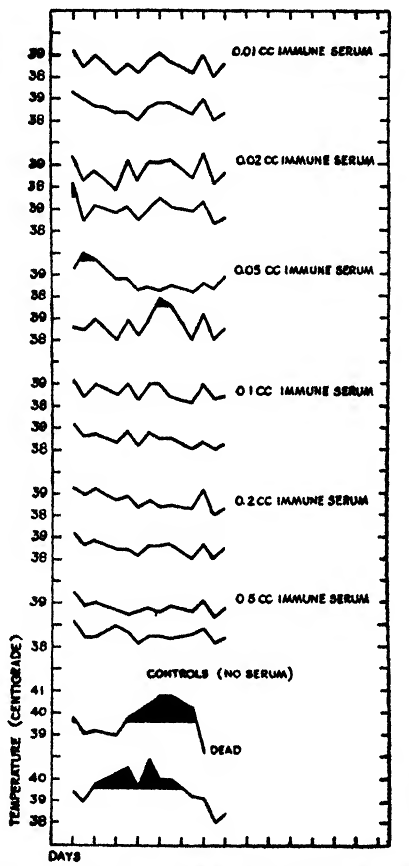

FIGURE 5.—Test for passive immunity in guinea pigs using guinea pig hyperimmune serum and plasma from a guinea pig infected with the "M" strain.

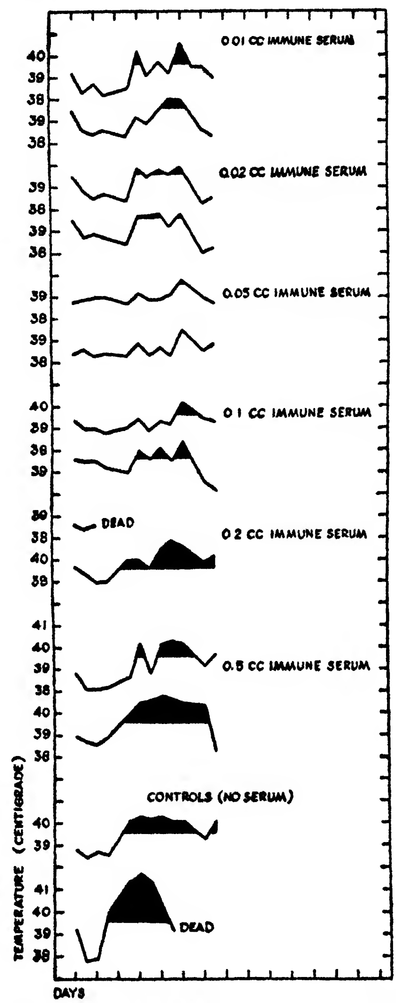

FIGURE 6.—Test for passive immunity in guinea pigs using guinea pig hyperimmune serum and plasma from a guinea pig infected with the "X" strain.

This same immune serum was similarly tested against plasma from a guinea pig inoculated with the "M" strain. Again there was less neutralization with the 0.5 cc. amount of immune serum and also with the 0.2 cc. amount than with the smaller amounts of 0.1 cc. and 0.05 cc. Temperature elevations occurred as early in these

as in the control animals without immune serum. With the two smallest amounts, 0.02 cc. and 0.01 cc., there was some protection

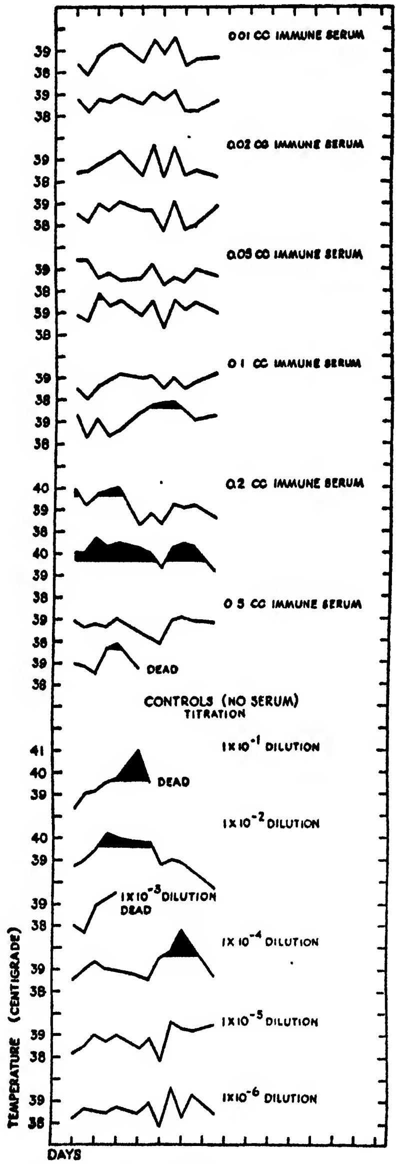

FIGURE 7.—Test for passive immunity in guinea pigs using rabbit hyperimmune serum and suspension of spleen and liver from a guinea pig infected with the "M" strain.

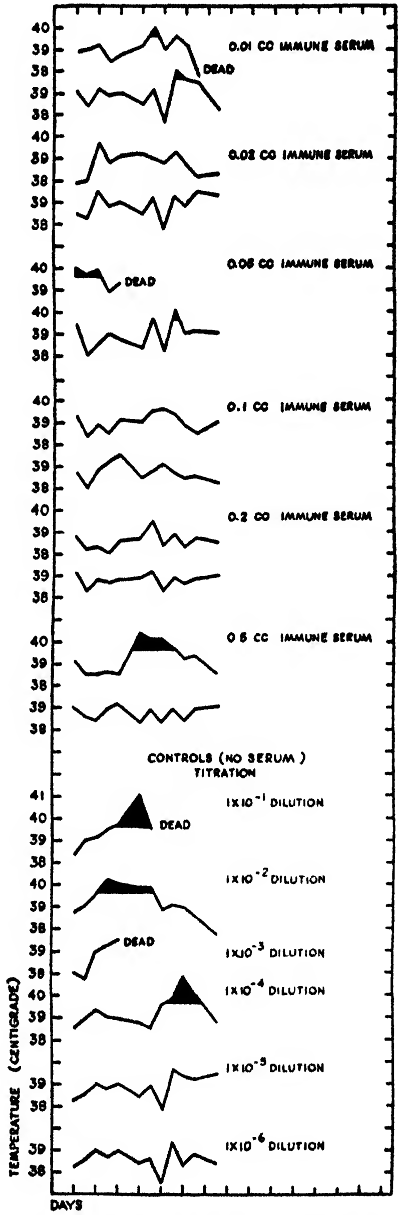

FIGURE 8.—Test for passive immunity in guinea pigs using guinea pig hyperimmune serum and suspension of spleen and liver from a guinea pig infected with the "M" strain.

as compared with the controls, but evidently there was a decline in the neutralizing power with these doses.

The greater degree of protection in the first test than in the second and third tests calls for explanation. Although the immune serum used in the second and third tests was obtained from animals that had received an additional inoculation of rickettsiae (a heavy suspension of killed rickettsiae), the protection afforded was less. However, the suspension of killed rickettsiae was not inoculated until 19 days following the last inoculation of live culture, and bleeding followed this in 12 days. The protective antibodies may have declined in the interval between the last inoculation with the living rickettsiae and may not have been reinforced following the inoculation of the killed organisms, although this was a very heavy suspension. On the other hand, the infective plasma may have been more potent. No titration was made of these two sera.

Figures 7 and 8 show the results obtained with hyperimmune guinea pig and rabbit serum against a 10 percent suspension of macerated spleen and liver from a guinea pig infected with the "M" strain.

With the rabbit serum (fig. 7) protection was afforded with the smallest amount used, 0.01 cc. The elevations of temperature in the animals inoculated with the mixture containing 0.2 cc. of immune serum were probably due to secondary infections, as the rise in temperature began the day following inoculation. One of the animals receiving 0.5 cc. of the serum showed a slight elevation of temperature on the fifth day and died on the seventh day.

The hyperimmune guinea pig serum (fig. 8) afforded complete protection with 0.02 cc. Partial protection was afforded by 0.01 cc. A secondary infection probably accounted for the elevation of temperature beginning the day following inoculation and the death of one of the animals inoculated with the mixture containing 0.05 cc. of serum. A rise in temperature lasting 1 day occurred in the other animal inoculated with the same mixture. Again one of the animals receiving the mixture containing 0.5 cc. of the serum ran an elevated temperature for 4 days. Transfers from this animal were made on the third day of temperature. These animals had elevations of temperature characteristic of "Q" fever, proving the lack of neutralization of the infected tissue suspension by the hyperimmune serum.

The titration of the suspension of infected spleen and liver used in these tests indicate a minimal infective dose of 1×10^{-4} cc. On this basis, 1 cc. of the hyperimmune rabbit serum neutralized 500,000 minimal infective doses of the spleen and liver suspension of the infected guinea pig. One cc. of the hyperimmune guinea pig serum protected against 250,000 minimal infective doses.

TESTS FOR PASSIVE IMMUNITY IN GUINEA PIGS WITH GUINEA PIG CONVALESCENT SERA

Tests were also made using sera from recovered guinea pigs instead of hyperimmune serum. In one such test the animal had been inoculated with 2 cc. of blood from an infected guinea pig 34 days before bleeding. Fever began on the fifth day and continued through the eighth day. The blood was, therefore, drawn 29 days after the beginning of fever.

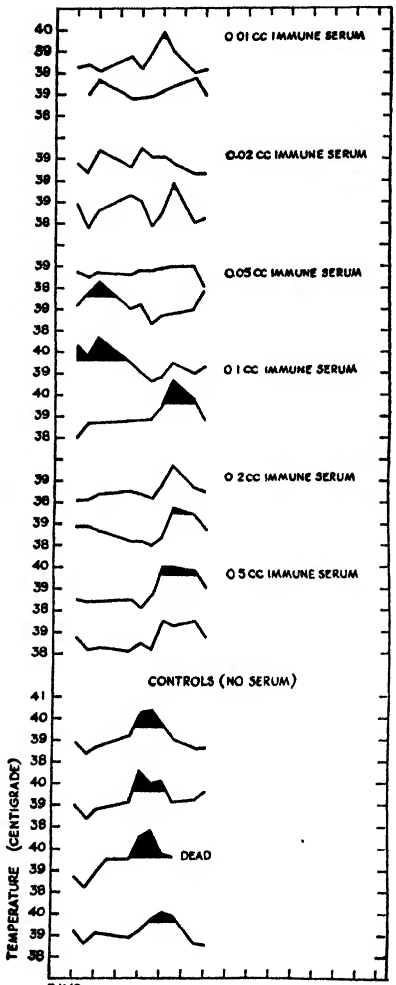

FIGURE 9.—Test for passive immunity in guinea pigs using guinea pig convalescent serum and plasma from a guinea pig infected with the "X" strain.

Agglutination of a suspension of "Q" fever rickettsiae was obtained in a dilution of 1:80 of this serum (1:10, 4+; 1:20, 4+; 1:40, 3+; and 1:80, 2+).

In the test for passive immunity with this serum the same dilutions of serum from the recovered guinea pig were mixed with 0.5 cc. of plasma of an infected animal as in the previous tests. The infected animal had fever on the sixth to the eighth day after inoculation and blood was drawn on the eighth day.

Figure 9 shows the results of this test. All four of the controls without convalescent sera had elevated temperatures beginning on the seventh or eighth day after inoculation and continuing for 3 days. Protection was afforded by all the dilutions of convalescent sera used, though as in the former tests there was a tendency for the animals receiving the larger amounts of convalescent serum, particularly one of the two animals receiving the 0.5 cc. amount, to show less neutralization as indicated by the longer period of fever in one of the animals receiving this amount. In one or both of each pair receiving the doses below 0.5 cc., except in the case of the pair receiving 0.05 cc. of the convalescent serum, there was a slight late elevation in temperature indicating partial neutralization.

In the titration of the plasma from the infected guinea pig used in this test there was definite evidence of typical "Q" fever temperature elevation in the animal receiving the 1×10^{-1} dilution. The animal receiving the 1×10^{-2} dilution showed no rise in temperature, while those receiving 1×10^{-3}, 1×10^{-4}, and 1×10^{-5} had 1 or 2 days late rise in temperature. There is a question, therefore, as to the true end-point. Though the results are clear cut when the controls receiving 0.5 cc. of virus plasma are considered, they are less so when the titration of the virus plasma is considered. On the basis of a minimal infective dose of 1×10^{-1} cc., 1 cc. of the convalescent serum neutralized 500 minimal lethal doses.

DISCUSSION

Rickettsial active and passive immunity in experimental animals as exemplified by "Q" fever follows in general the same laws as those which apply in bacterial active and passive immunity. Active immunity results when the disease has run its course in the animal or when killed organisms are introduced into the body. Evidence of immunity is found in resistance to reinfection with the disease, in the development of agglutinating antibodies and neutralizing antibodies. Sera from animals which have recovered from the disease or which have received killed cultures confer passive immunity when mixtures of the immune serum and the infecting agent are inoculated into animals.

The questions of the time when immunity begins, the duration of immunity, and the matter of the relationship of the various antibodies resulting from the disease or from artificial immunity, are the same as those which arise in bacterial immunity.

Active immunity can be readily produced in experimental animals by the use of killed rickettsial vaccines. Such vaccines immunize in suspensions as low as 2½ percent (¼₀ dilution) of the original tissue, or probably lower. By the use of infected yolk sac of high titer for the inoculation of mice and guinea pigs the number of rickettsiae in the spleens and livers of mice and guinea pigs may be increased and these infected spleens and livers are suitable and convenient material for the preparation of vaccines. Protection was afforded in guinea pigs against 10,000 to 10,000,000 infectious doses of such vaccines.

Hyperimmune sera may be produced in guinea pigs and rabbits by inoculation of killed cultures followed by living organisms. Repeated inoculations of killed cultures by the intravenous route in rabbits failed to raise the titer of the serum above 1:640. By several added subcutaneous inoculations of living organisms the titer was raised to 1:10,240.

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Tests for passive immunity in guinea pigs with hyperimmune rabbit and guinea pig sera demonstrated neutralization of 250,000 to 500,000 minimal infectious doses by 1 cc. of hyperimmune serum.

Tests for passive immunity in guinea pigs with convalescent guinea pig serum gave evidence of protection against 500 minimal infectious doses.

The "zone phenomenon" observed in the neutralization tests described raises the question of the factors responsible for this discrepancy, there being less neutralization in a number of tests with the larger amounts of serum employed than with the smaller amounts. This was observed with both the hyperimmune and the convalescent sera. It seems possible that this effect was related to the presence or absence of saline in the mixtures. As prepared there was no saline in the mixture containing the largest amount of immune serum. It would appear that the presence of a certain amount of saline is conducive to the neutralization of the virus by the immune serum. This is probably related to the phenomenon of dissociation of virus-antiserum mixtures in influenza as described by Burnet (*9*). In view of the fact that in all the tests made there was evidence of neutralization with amounts as small or smaller than 0.1 cc. it would seem desirable that neutralization tests be carried out with mixtures containing a certain amount of saline.

SUMMARY

Vaccines were prepared from the spleens and livers of mice and the spleens of guinea pigs inoculated with high titer "Q" fever infected yolk sac suspensions. Vaccines prepared from 2½ percent suspensions of such infected tissue immunized guinea pigs against 10,000 to 10,000,000 minimal infective doses.

Hyperimmune sera were produced in guinea pigs and rabbits by the inoculation of killed cultures followed by live cultures. These agglutinated suspensions of "Q" fever rickettsiae in dilutions up to 1:10,240.

Tests for passive immunity in guinea pigs were made using hyperimmune sera and convalescent sera from guinea pigs. Hyperimmune sera neutralized up to 500,000 minimal infective doses and convalescent serum neutralized 500 minimal infective doses.

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THE EFFECT OF SODIUM SELENITE ON THE BLOOD SUGAR AND LIVER GLYCOGEN OF RATS AND RABBITS [1]

By C. I. Wright, *Pharmacologist, United States Public Health Service*

Jones (*1*) stated that sublethal doses of sodium selenite caused a disappearance of glycogen from the liver of the rat. He did not determine the glycogen quantitatively and apparently neglected the fact that rats receiving large doses of selenite fail to eat and might deplete their liver glycogen by that means alone. Fillippi (*2*) observed a marked glycosuria in rabbits chronically poisoned with selenate and a slight glycosuria when given selenite. He found no evidence of hyperglycemia. Levine and Flaherty (*3*) found that acutely toxic doses of sodium selenite caused a hypoglycemia in fasted rabbits and also stated that the glycogen of the liver suffered a decrease due to the selenite. Pellegrino and Gaizzone (*4*) observed an increase in the blood sugar of fasted rabbits after intramuscular injection of selenate.

In view of the above apparent contradictions as to the effect of selenium on blood sugar and the inadequacy of the data on the effect of selenium on liver glycogen, determinations were made on the blood sugar of fasted and well-fed rats and rabbits and the liver glycogen of rats after injection of sodium selenite. Interest in the subject arose from the finding (*5*) that selenium causes an increase in the aerobic glycolysis of liver slices.

METHODS

The glycogen determinations were made by the method of Good et al. (*6*), using approximately 0.8 gram of liver cut from the central lobe. The liver was digested at approximately 100° C. in 2.0 cc. of 30 percent KOH for 30 minutes or more and the glycogen precipitated with 3 cc. of alcohol. The precipitate was dissolved in water, reprecipitated with alcohol, and then hydrolyzed in normal H_2SO_4 for 2 hours at 100° C. After neutralization to phenol red and suitable

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dilution, the glucose was determined by the method of Shaffer and Somogyi (7) using the reagent containing 1 gram of KI. Control determinations on samples of known glucose concentration were always made and blank analyses were run with each series of determinations.

The rat blood sugar determinations were made on 1.0 cc. of blood collected on decapitation and, before coagulation, added to 8 cc. of 1.25 percent zinc sulfate solution, precipitated with 1.0 cc. of 0.75 N NaOH, filtered, and the filtrate analyzed for glucose by the Shaffer-Somogyi (7) procedure. Determinations of the rabbit blood sugar were made on 0.5 cc. of blood collected from the marginal ear vein with a few crystals of lithium oxalate to prevent coagulation. The 0.5 cc. of blood was precipitated with 4 cc. of $ZnSO_4$ solution plus 0.5 cc. of 0.75 N NaOH, centrifuged, and the supernatant fluid analyzed for glucose. Duplicate blood sugar determinations were always made if the amount of glucose-containing solution allowed.

The rabbits were on a stock diet of Purina rabbit chow plus cabbage, and the rats were fed diet 242 (8) previous to the experimental period.

RESULTS

Figure 1 shows the values (mg. percent) obtained for the blood sugar of well-fed rats after intravenous injection of sodium selenite at the dosages given. The selenite was dissolved in water at a concentration of 2 to 4 mg. per cc. and a volume of 0.2 to 0.6 cc. injected. Fifteen control animals injected with 0.9 percent of NaCl had an average blood sugar of 106 mg. percent with a variation between 94 and 115 mg. percent. Doses of 5.0 or more mg. per kg. of sodium selenite caused a definite increase in blood sugar within a period of 2 to 4 hours after injection.

TABLE 1.—*The effect of sodium selenite on the liver glycogen concentration of the rat*

Animals	Na_2SeO_3 mg./kg.	Injected	Killed	Glycogen range, grams percent	Glycogen average, grams percent
4	7.0	9:58-10:08	1:00- 2:12	4 2-5.9	5.1
4	Controls		1:00- 2:15	4 5-5.7	5.2
2	10.0	9:52- 9.58	12:27-12:32	1 7-2 5	2.1
5	12.0	9:47- 9:55	12:12- 1:07	2.2-4.9	3.9
6	Controls		12:00 - 1:00	4.2-5.8	5.3

The livers of the animals receiving 7, 10, and 12 mg. per kg. of selenite were analyzed for glycogen and the results are included in table 1, as grams of glycogen per 100 gm. of wet liver. Seven mg. per kg. of selenite caused no change in the liver glycogen concentration 3 to 4 hours after the injection. Ten and 12 mg. per kg., however, definitely decreased the liver glycogen in 6 of the 7 animals

injected. Diselenodiacetic acid was also injected into a small group of rats over a dose range of 20 to 50 mg. per kg. without measurably changing the liver glycogen concentration, although the blood sugar was raised slightly (130–150 mg. percent).

Figure 2 shows the typical effects of sodium selenite on the blood sugar of well-fed rabbits at various periods after a subcutaneous injection. The blood sugar as mg. percent is plotted against the time in hours after the injection. Doses above 3 mg. per kg. were rapidly fatal to the animals and the time of death is indicated by the symbols along the abscissa. Two mg. per kg. of selenite never caused a rise or

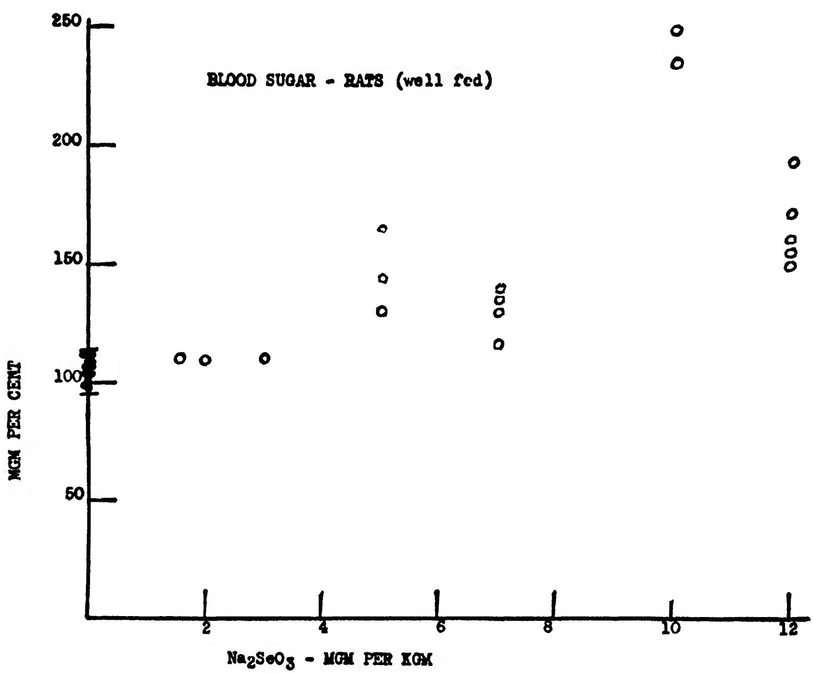

FIGURE 1.—The concentration of glucose in the blood of the white rat (Wistar) after intravenous injections of sodium selenite.

fall in the blood sugar. Three mg. caused a transient rise in blood sugar in some animals but had no effect on others. Above 3.0 mg. per kg. a marked hyperglycemia was always observed, reaching values of 400 to 600 mg. percent and terminating in the death of the animal. At any one dose the rate of rise and the maximum reached varied considerably but no decrease in blood sugar was ever noted at any dose administered. Figure 3 shows the typical effects of subcutaneous injections of sodium selenite into rabbits that had previously been fasted for 24 hours. In contrast to the fed animals the blood sugar rises only slightly at doses of 4 or 5 mg. per kg. A fall in blood sugar

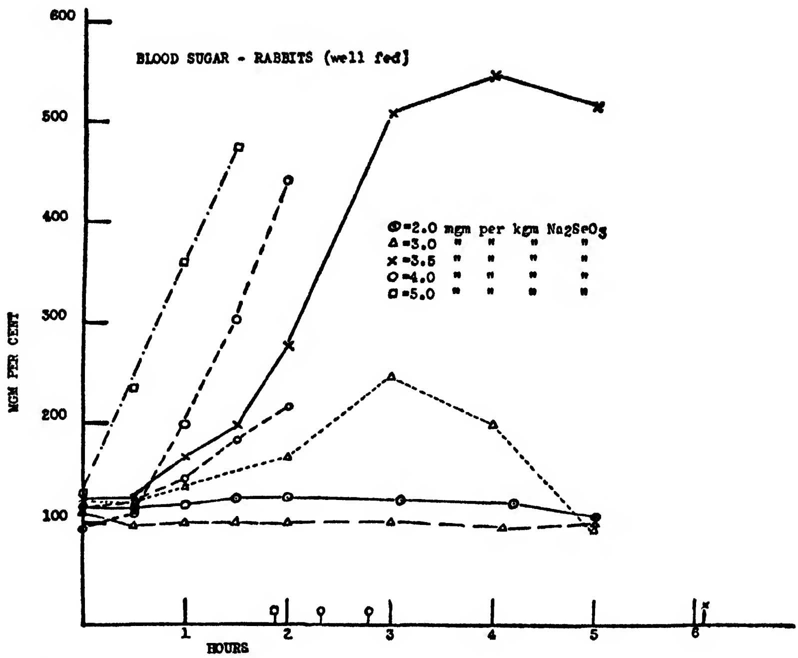

FIGURE 2.—The blood sugar concentrations of well-fed rabbits after subcutaneous injections of sodium selenite. The symbols on the abscissa indicate the time of death of the animal.

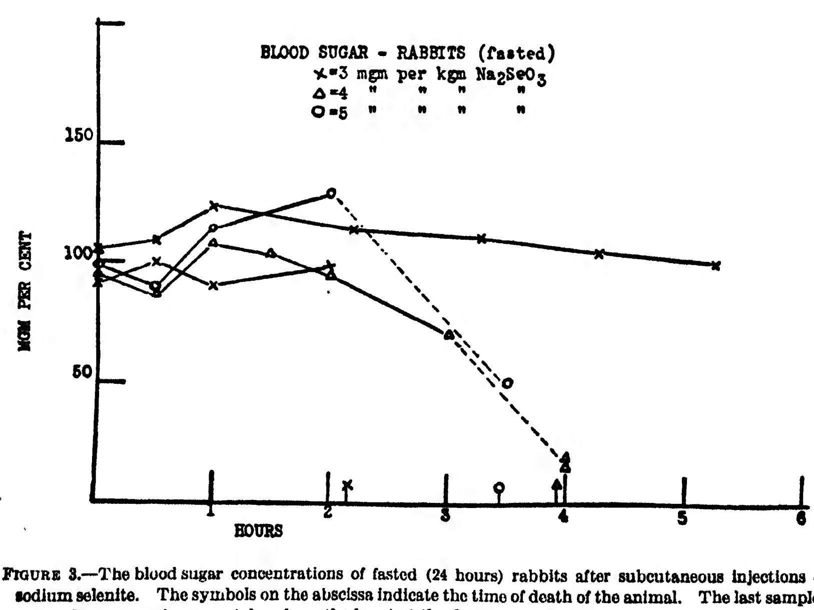

FIGURE 3.—The blood sugar concentrations of fasted (24 hours) rabbits after subcutaneous injections of sodium selenite. The symbols on the abscissa indicate the time of death of the animal. The last samples at 4 and 5 mg. per kg. were taken from the heart at the death of the animal.

sometimes followed large doses when the animal was in a practically moribund condition and a hypoglycemia was always found when the blood was drawn from the heart of the animal at death. The last two

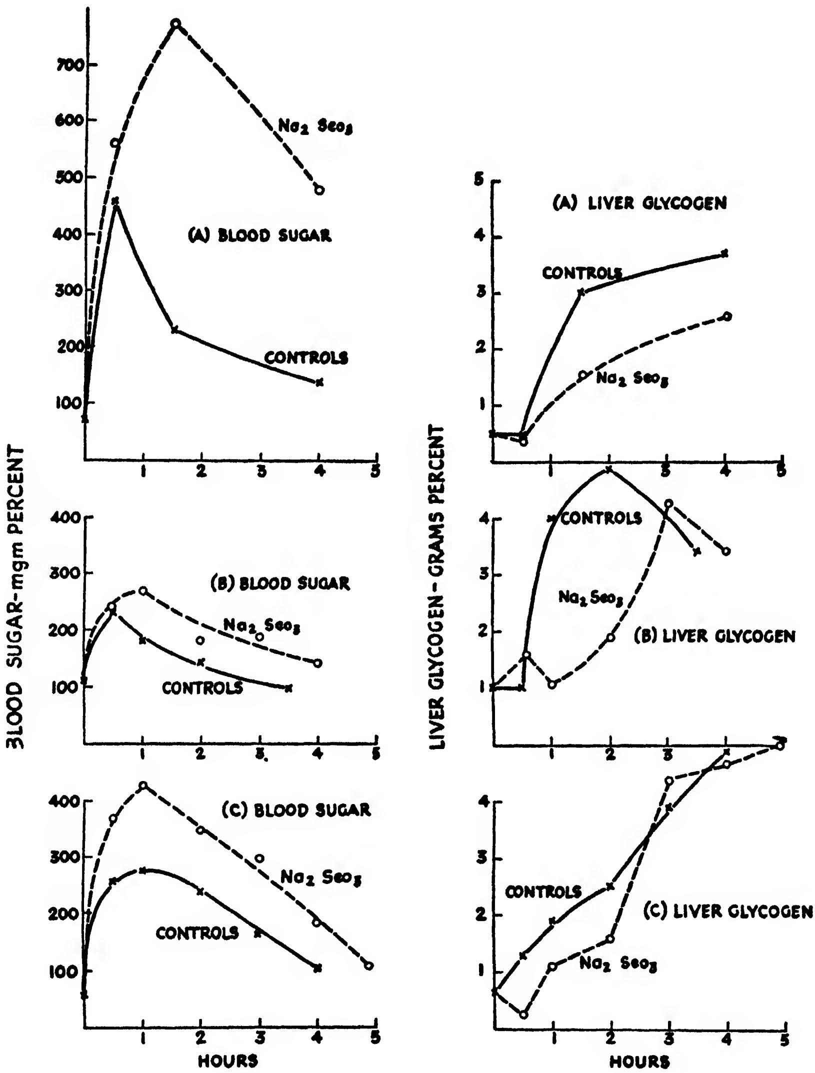

FIGURE 4.—The blood sugar and liver glycogen concentrations of fasted rats after subcutaneous injections of glucose and intravenous injections of sodium chloride (controls) or 5 mg. per kg. of sodium selenite. The solid lines represent the control animals and the broken lines the animals that received selenite.

values on the curve representing 4 mg. per kg. and the last value on the curve representing 5.0 mg. per kg. were taken from the hearts of the animals while they were dying. One rabbit survived a 3.0-mg. dose

until the day following the injection (26 hours) when a sample of blood from the ear vein gave a value of 6.5 mg. percent glucose. Two samples taken from the heart of the same rabbit one-half hour later (at death) gave values of 3.5 and 4.0 mg. percent. Blood taken from two other animals that survived doses of 2.5 mg. per kg. showed no decrease in blood sugar the day following the injection, beyond what would be expected from a prolonged fasting period.

In order to determine whether selenite interfered with the deposition of glucose as glycogen in the liver, a series of experiments was made on fasted rats receiving subcutaneous injections of glucose with and without the intravenous injection of sodium selenite. Groups of 8 to 13 fasted rats of one sex were first injected with selenite or 0.9 percent sodium chloride (controls) and then all but one animal received a subcutaneous injection of glucose. The animal receiving neither selenite nor glucose was killed for determination of initial blood glucose and liver glycogen. The remaining animals were then killed in pairs at desired intervals and the blood sugar and liver glycogen determined. The results of three such experiments are given in graphic form in figure 4. All three groups received 5 mg. per kg. of sodium selenite or an equivalent volume of sodium chloride (controls). Group A (males) was fasted for 48 hours and given 5.0 cc. of a 15-percent glucose solution. Group B (females) was fasted 24 hours and given 4.0 cc. of a 12-percent glucose solution. Group C (males) was fasted 48 hours and received an injection of 4.2 cc. of a 12-percent glucose solution.

The graphs to the left of figure 4 show the increase in blood sugar due to the absorbed glucose. In each series the blood sugar reached a higher maximum and returned to normal levels more slowly when the animals had received an intravenous injection of sodium selenite. The graphs to the right of figure 4 show the rate of deposition of glycogen in the livers of the same animals. In each experiment the glycogen was deposited more slowly in the animals receiving the selenite. The delay was limited, however, to the first 3 hours, except in the first experiment. The animals apparently recover the ability to form glycogen quite rapidly after an initial interference with the mechanism for glycogenesis.

DISCUSSION

It is evident that toxic doses of sodium selenite cause an increase in the blood sugar concentration of well-fed rats and rabbits. Lethal doses also measurably decrease the liver glycogen of the rat and presumably this is the source of the glucose in the blood. With the evidence that selenite causes an increase in the *in vitro* aerobic glycolysis of liver slices from well-fed rats (*5*), it appears that selenium acts directly on the glycogenolytic mechanism to speed up the hydrolysis of glycogen to glucose and other oxidizable substrates.

The fasted rabbits showed no such increase in blood sugar as the fed animals and sometimes, as found by Levine and Flaherty (*3*), a decrease was observed but only when the animal was in a semi-moribund condition.

Potter, Dubois, and Moxon (*9*) have recently reported that the ingestion of seleniferous wheat causes a decrease in the liver glycogen storage. The livers of their control animals, however, were low in glycogen and the decrease noted in the experimental animals might have been due to decreased food intake since they suffered from inanition and loss of weight. A series of determinations were made by the author on the livers of rats which had been used for comparison of the effect of diet on selenium toxicity (*10*). These rats were on diets 25 and 30, composed principally of seleniferous (20 p. p. m. selenium) and nontoxic wheat (*10*). Eight male animals on diet 25 had an average liver glycogen concentration of 4.6 gm. percent while the control animals had a concentration of 6.8 gm. percent. The figures are not given in detail, nor considered very significant, since it was known that the experimental animals did not eat as well and that a short period of fasting has a marked influence on the liver glycogen stores in the rat. It seems necessary to match the food intake of the experimental and control animals to decide whether chronic selenosis decreases liver glycogen, and even then the time of food ingestion in relation to removal of the liver would be a factor contributing to the results found.

SUMMARY

Intravenous doses of sodium selenite greater than 5.0 mg. per kg. cause an increase in the blood sugar concentration of the rat and 10.0 mg. per kg. cause a measurable decrease in liver glycogen.

Subcutaneous doses of sodium selenite greater than 3.0 mg. per kg. cause a marked rise in the blood sugar concentration of well-fed rabbits. The same doses sometimes cause a slight rise in the blood sugar of the fasted rabbit, followed occasionally by an abrupt fall preceding the death of the animal.

Fasted rats have a lower glucose tolerance when injected with sodium selenite and the rate of deposition of liver glycogen from the injected glucose is slowed f r 2 or more hours.

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NEW EDUCATIONAL FILM TO AID NUTRITION CAMPAIGN

As a contribution to nutrition education, the United States Public Health Service recently cooperated in the production of a motion picture entitled "Proof of the Pudding," designed primarily to acquaint the public with the importance of the right choice of food in maintaining health.

The picture presents important nutritional knowledge in an effective manner. Scenes in a nutrition laboratory emphasize the fact that our knowledge of the dietary needs of human beings is based on scientific research. An animated chart shows the foods needed for energy, building and repair of the body, the maintenance of body processes, and protection against disease. It is pointed out that these foods form the nutritional basis for good health, and that when any one of them is withheld or used in too small an amount, disease or conditions of subnormal health result.

The results of specific dietary deficiencies are demonstrated in animals. A typical healthy family reveals the result of proper nutrition, while the important specific indications of good nutrition are emphasized by a physical examination in a doctor's office. The buoyant health of the children is credited to the mother, who provided them an excellent start in life by observing a proper dietary before they were born and continuing to provide the right kind of food as they grew up. The initial scene in a zoo kitchen contrasts the scientific feeding of the animals with the unscientific method of many families.

The Surgeon General has recently pointed out that proper nutrition is the first requirement of good health. Recent research, in the laboratory and in the field, has not only revealed that a large part of our population is suffering from dietary deficiencies which result in manifest disease or lowered physical resistance, but has resulted in knowledge of means of correcting those conditions through proper diet.

"Proof of the Pudding" is a technicolor, 10-minute sound film, professionally produced, and should be a valuable supplement to

radio programs and published material on nutrition. For the time being it will be shown only in the commercial theaters, to which it is made available without cost. State health officers are cooperating in having it presented in their States in connection with State-wide nutrition education programs.

Further information regarding prints and publicity material may be had from the Welfare Division, Metropolitan Life Insurance Co., New York, N. Y., with which the Public Health Service cooperated in producing the film.

STUDY OF EFFECTS OF KETONE VAPOR INHALATION [1]

The work reported is concerned with acute effects on guinea pigs. Data were collected on effects on cornea and conjunctiva, buccal, nasal, and pharyngeal mucosae, central nervous system, circulatory system, etc. The general summary follows:

1. The inhalation of vapors of dimethyl, methyl ethyl, methyl propyl, methyl n-butyl, methyl iso-butyl, methyl n-amyl, and methyl n-hexyl ketone and acetonylacetone, cyclohexanone, and methyl iso-butenyl ketone by guinea pigs produces a progressive general narcosis characterized by the depression of the body temperature, the respiratory rate, and the heart rate, as well as the abolition of corneal, auditory, and equilibratory reflexes.

2. The depression of the various bodily functions is directly proportional to the concentration of the inhaled vapor, to the duration of the exposure, and, in the homologous series of straight-chain methyl ketones, to the number of carbon atoms in the chain. Respiratory and cardiac hyperfunction have been observed in cyclohexanone and methyl iso-butenyl ketone only during moderate and low concentrations in the stage following reflex depression.

3. The degree of depression of the various bodily functions is most closely paralleled by the partition coefficient of ketone in oil over water, methyl iso-butenyl ketone and acetonylacetone excepted.

Modifications in the molecular structure other than extension of the carbon chain are concomitant with relatively unpredictable narcotic strengths.

4. The inhalation of ketone vapors in concentrations that irritate the mucosae of the naso-pharyngeal region causes a transient reflex depression of the respiratory and heart rate. This phenomenon furnishes a limiting index for adequate warning properties during the inhalation of these ketones.

[1] Acute response of guinea pigs to the inhalation of ketone vapors. By A. Specht, J. W. Miller, P. J. Valaer, and R. R. Sayers. National Institute of Health Bulletin No. 176. Available from the Superintendent of Documents, Government Printing Office, at 15 cents per copy.

5. The pathology of acute exposure to ketone vapor by inhalation is characterized by a general congestion in guinea pigs due to central vasomotor disturbances. Long-continued exposures result in extravasations in the capillary beds, particularly in the lungs.

COURT DECISION ON PUBLIC HEALTH

Power of State board of health to make regulations concerning milk and other dairy products.—(Kansas Supreme Court; *State* v. *Reynolds*, 107 P.2d 728; decided December 7, 1940.) A person who was convicted in the lower court of violating certain milk regulations of the Kansas State Board of Health appealed to the supreme court, his principal contention being that the power to promulgate regulations relative to the production and sale of milk and other dairy products was vested by statute exclusively in the State board of agriculture. The numerous and comprehensive statutory provisions involved in the determination of the question were reviewed by the appellate court, it being pointed out that the board of health relied upon the broad powers conferred upon it in matters affecting the public health and particularly upon general provisions contained in the food and drug acts, while the board of agriculture stood upon the comprehensive statutes dealing specifically with the production, handling, and sale of milk and other dairy products. The court, for brevity, denominated these statutes as the food and drug acts and the milk acts, respectively.

The fundamental issue of jurisdiction as between authority conferred by the food and drug acts, general in character, and that conferred by the milk acts, particular and specific in character, was said to be directly raised for the first time, and the conclusion reached was that the legislature intended to place in the board of agriculture exclusive jurisdiction to regulate the production, manufacture, handling, and sale of milk and dairy products—except as hereinafter noted—and did not intend to subject those who were so regulated to dual supervision. "We think," said the court, "the situation clearly falls within the well-established rule of statutory construction that where a statute of a general nature and one of a particular or special nature are in conflict, the latter prevails over the former."

The exception to the conclusion that the milk acts had taken from the board of health regulatory power as to milk and other dairy products related to the subjects of adulteration and misbranding. These were dealt with minutely and comprehensively in the food and drug acts and there were no comparable provisions in the milk acts. The court concluded that, as to adulteration and misbranding, the board

of health could make regulations applicable to milk and other dairy products within the powers conferred upon it for such purpose. "Such regulations may relate only to the ingredients, the constituent elements, the character or nature of such products in order to safeguard the public health or to prevent deception, and may not otherwise relate to the sale, or to the production, manufacture or handling of them or to other matters subject to exclusive regulation by the State board of agriculture."

With reference to the counts upon which the appellant was convicted the supreme court held that certain of them were predicated upon regulations of the board of health which clearly related to matters within the exclusive jurisdiction of the board of agriculture and that the others were based upon regulations which, even though containing some possibly valid provisions, were invalid because inextricably tied up with requirements as to production, handling, etc.

The judgment of the lower court was reversed and the case remanded with directions to set aside the conviction and the sentence.

DEATHS DURING WEEK ENDED FEBRUARY 8, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 8, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	10,193	10,030
Average for 3 prior years	9,505	
Total deaths, first 6 weeks of year	59,447	58,061
Deaths under 1 year of age	527	543
Average for 3 prior years	552	
Deaths under 1 year of age, first 6 weeks of year	3,342	3,305
Data from industrial insurance companies:		
Policies in force	64,686,023	66,294,279
Number of death claims	13,835	13,689
Death claims per 1,000 policies in force, annual rate	11.2	10.8
Death claims per 1,000 policies, first 6 weeks of year, annual rate	10.7	10.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 15, 1941

Summary

The decline in the incidence of influenza, which began with the week ended January 25, has continued during each of the succeeding weeks. For the current period, a total of 21,989 cases was reported, as compared with 38,241 for the preceding week. Each geographic division recorded a decrease in the number of cases reported, although slight increases were noted for a few States. The largest increase was reported in Arkansas, with 1,453 cases as compared with 767 cases for the preceding week.

Of the 9 communicable diseases included in the following weekly table, the incidence of measles alone was higher than for the preceding week, while only influenza, measles, and poliomyelitis were above the 5-year (1936–40) median. The accumulated totals to date of these diseases and of whooping cough were also above the 5-year cumulated medians. The current incidence of diphtheria, meningococcus meningitis, scarlet fever, smallpox, and typhoid fever is lower than that for the corresponding week of any of the preceding 5 years. Twenty-nine of the 47 cases of typhoid fever were reported from the South Atlantic and South Central States, and 32 of the 37 cases of smallpox occurred in the North Central States.

Three cases of undulant fever were reported in Mississippi, and 1 case each in Maryland and Indiana. Of 24 cases of endemic typhus fever, 9 occurred in Georgia and 4 in Florida.

For the current week, the Bureau of the Census reports 9,731 deaths in 88 major cities of the United States, as compared with 10,229 (corrected figure) for the preceding week and a 3-year (1938–40) average of 9,451. The crude death rates for 92 large cities for the corresponding periods were 13.6, 14.3, and 13.2 (88 cities).

Telegraphic morbidity reports from State health officers for the week ended February 15, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Feb. 15, 1941	Feb. 17, 1940		Feb. 15, 1941	Feb. 17, 1940		Feb. 15, 1941	Feb. 17, 1940		Feb 15, 1941	Feb. 17, 1940	
NEW ENG.												
Maine	0	3	1	112	7	8	122	217	87	0	0	0
New Hampshire	0	0	0	-----	-----	-----	4	84	30	0	0	0
Vermont	0	0	0	-----	-----	-----	29	2	7	1	0	0
Massachusetts	2	4	7	-----	-----	-----	454	320	706	2	0	2
Rhode Island	1	0	1	1	-----	-----	0	96	58	0	0	0
Connecticut	0	0	0	90	3	12	84	108	122	0	0	0
MID. ATL.												
New York	15	26	35	[1] 182	[1] 43	[1] 69	3,375	274	1,048	8	4	9
New Jersey	7	12	12	704	30	30	1,076	49	70	0	0	3
Pennsylvania	20	35	39	-----	-----	-----	3,189	74	204	4	20	9
E. NO. CEN.												
Ohio[2]	2	22	22	272	202	95	395	46	54	0	1	4
Indiana	12	17	24	113	596	220	222	5	10	2	0	1
Illinois	18	23	31	127	128	128	1,995	18	26	1	0	0
Michigan[3]	5	6	10	120	31	12	1,965	275	275	1	2	2
Wisconsin	1	4	1	731	112	70	769	165	165	0	0	0
W. NO. CEN.												
Minnesota	5	3	3	240	2	3	10	366	195	0	1	1
Iowa	7	3	7	321	86	27	162	174	100	1	0	2
Missouri	5	8	10	38	59	158	86	15	15	1	1	2
North Dakota	3	0	1	113	20	14	6	3	4	1	0	0
South Dakota	0	0	1	9	6	3	31	2	2	0	0	0
Nebraska	4	5	5	8	-----	-----	1	95	16	0	0	1
Kansas	3	11	11	105	32	32	230	479	26	0	5	1
SO. ATL.												
Delaware	0	1	1	-----	-----	-----	110	1	34	0	0	0
Maryland[3]	7	3	11	349	131	131	60	2	214	4	3	3
Dist. of Col.	0	5	5	37	19	18	31	2	8	0	0	1
Virginia	6	19	17	4,018	2,395	-----	1,060	33	176	2	4	8
West Virginia[3]	7	6	7	1,185	954	88	134	6	8	0	0	4
North Carolina[4]	12	17	17	529	121	93	257	109	109	0	0	1
South Carolina[4]	2	11	4	2,217	1,041	1,041	64	6	13	0	1	1
Georgia[4]	4	7	11	919	486	486	248	405	161	1	1	2
Florida[4]	4	5	5	220	50	18	58	55	53	0	0	0
E. SO. CEN.												
Kentucky	4	9	13	396	136	136	599	42	70	2	2	13
Tennessee	13	8	9	533	677	245	155	108	108	7	4	4
Alabama[4]	7	8	14	1,698	942	686	140	148	148	3	1	5
Mississippi[3]	5	6	5	-----	-----	-----	-----	-----	-----	0	0	2
W. SO. CEN.												
Arkansas	8	5	9	1,453	1,555	219	38	16	16	0	2	2
Louisiana[4]	4	6	13	168	342	48	8	3	11	0	2	2
Oklahoma	4	11	8	395	655	217	7	3	6	0	0	2
Texas[4]	22	41	56	2,545	4,543	983	518	304	228	2	3	6
MOUNTAIN												
Montana	6	3	1	51	4	18	6	38	38	0	0	0
Idaho	0	0	0	93	-----	6	8	26	26	0	0	0
Wyoming	0	1	0	103	5	1	20	34	3	0	0	0
Colorado	12	13	13	78	27	-----	106	34	34	0	3	0
New Mexico	6	1	2	94	4	4	136	5	42	1	0	0
Arizona	5	0	1	211	259	157	0	20	21	0	4	2
Utah[3]	2	0	0	114	10	-----	31	203	81	0	0	0
Nevada	0	-----	-----	-----	-----	-----	2	-----	-----	0	-----	-----
PACIFIC												
Washington	5	2	1	21	3	3	93	664	174	0	1	1
Oregon	1	8	2	37	70	70	193	351	27	1	0	0
California	20	20	28	[5] 1,239	771	771	98	374	374	0	2	4
Total	276	398	524	21,989	16,557	9,077	18,385	5,859	7,872	45	67	102
7 weeks	2,116	3,026	4,086	516,438	98,737	27,772	89,312	31,841	39,543	309	265	654

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 15, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Feb. 15, 1941	Feb. 17, 1940		Feb. 15, 1941	Feb. 17, 1940		Feb. 15, 1941	Feb. 17, 1940		Feb. 15, 1941	Feb. 17, 1940	
NEW ENG.												
Maine	0	0	0	7	26	23	0	0	0	0	0	0
New Hampshire	0	0	0	4	4	6	0	0	0	0	0	0
Vermont	0	0	0	14	12	12	0	0	0	0	0	0
Massachusetts	0	0	0	125	146	252	0	0	0	0	1	2
Rhode Island	1	0	0	3	11	19	0	0	0	0	0	0
Connecticut	0	0	0	48	92	92	0	0	0	0	1	1
MID. ATL.												
New York	3	1	0	409	750	771	0	0	0	2	4	4
New Jersey	0	0	0	275	466	204	0	0	0	1	0	1
Pennsylvania	0	2	0	320	370	525	0	0	0	2	2	4
E. NO. CEN.												
Ohio	0	0	0	90	419	419	0	0	1	2	1	1
Indiana	0	0	0	179	236	231	1	0	2	3	8	2
Illinois	2	1	1	445	524	657	7	0	21	2	3	3
Michigan [3]	1	0	1	182	290	538	3	0	3	0	2	2
Wisconsin	2	3	0	115	170	284	4	10	5	0	0	0
W. NO. CEN.												
Minnesota	1	1	0	51	109	151	8	7	8	0	1	1
Iowa	1	1	0	75	59	142	1	6	29	0	1	1
Missouri	0	0	0	87	80	170	2	9	9	1	0	1
North Dakota	0	0	0	26	21	42	0	0	1	0	2	1
South Dakota	0	0	0	21	30	30	0	3	3	0	0	0
Nebraska	0	0	0	27	18	90	0	0	6	0	0	0
Kansas	2	0	0	79	88	201	6	0	13	1	1	1
SO. ATL.												
Delaware	0	0	0	16	25	11	0	0	0	0	0	0
Maryland [3]	1	0	0	73	65	56	0	0	0	3	0	1
Dist. of Col.	0	0	0	7	24	21	0	0	0	0	1	1
Virginia	0	0	0	35	27	37	0	0	0	1	2	3
West Virginia [3]	0	1	1	30	78	57	0	0	0	0	2	2
North Carolina [4]	2	0	0	41	55	42	0	0	0	1	0	1
South Carolina [4]	0	0	0	16	8	6	0	0	0	0	1	1
Georgia [4]	2	0	0	21	18	18	0	0	0	4	2	3
Florida [4]	1	0	0	7	20	11	0	0	0	2	2	2
E. SO. CEN.												
Kentucky	2	2	2	90	59	59	0	1	1	0	1	3
Tennessee	1	2	0	91	103	43	2	0	0	5	0	1
Alabama [4]	0	1	0	14	15	19	0	0	0	0	0	1
Mississippi [3]	0	0	0	5	6	7	0	3	1	3	1	2
W. SO. CEN.												
Arkansas	2	1	0	27	7	10	0	2	4	1	1	1
Louisiana [4]	0	1	1	11	6	8	0	0	0	1	3	5
Oklahoma	0	1	1	30	23	35	0	1	1	0	4	3
Texas [4]	0	4	2	30	53	108	0	1	2	8	7	9
MOUNTAIN												
Montana	0	0	0	45	24	32	0	0	6	0	1	1
Idaho	0	0	1	14	12	22	0	0	4	0	2	1
Wyoming	0	0	0	8	9	11	1	1	0	0	0	0
Colorado	0	0	0	26	55	37	2	9	9	2	0	0
New Mexico	0	0	0	5	21	21	0	0	0	0	2	2
Arizona	0	0	0	5	4	13	0	1	0	0	0	0
Utah [3]	1	2	0	13	28	33	0	1	0	0	1	0
Nevada	0	----	----	0	----	----	0	----	----	0	----	----
PACIFIC												
Washington	0	0	0	18	58	57	0	0	2	0	0	0
Oregon	0	0	0	17	18	48	0	0	3	0	1	1
California	3	3	2	142	162	176	0	0	9	2	3	3
Total	28	27	25	3,419	4,904	5,781	37	55	253	47	64	105
7 weeks	245	230	150	22,889	30,855	41,718	341	508	2,081	492	539	770

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 15, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Whooping cough, Week ended Feb. 15, 1941	Whooping cough, Week ended Feb. 17, 1940
NEW ENG.		
Maine	9	34
New Hampshire	3	3
Vermont	7	41
Massachusetts	244	119
Rhode Island	8	3
Connecticut	56	45
MID. ATL.		
New York	332	418
New Jersey	105	120
Pennsylvania	96	377
E. NO. CEN.		
Ohio [2]	158	224
Indiana	38	34
Illinois	106	75
Michigan [2]	254	145
Wisconsin	98	137
W. NO. CEN.		
Minnesota	43	20
Iowa	30	12
Missouri	28	9
North Dakota	7	8
South Dakota	19	2
Nebraska	4	5
Kansas	152	43
SO. ATL.		
Delaware	17	11
Maryland [3]	102	116
Dist. of Col.	10	18
Virginia	148	47
West Virginia [3]	43	21
North Carolina [4]	[5] 271	84
SO. ATL.—continued		
South Carolina [4]	78	15
Georgia [4]	14	27
Florida [4]	4	7
E. SO. CEN.		
Kentucky	88	48
Tennessee	64	37
Alabama [4]	25	33
Mississippi [3]		
W. SO. CEN.		
Arkansas	8	5
Louisiana [4]	3	11
Oklahoma	29	0
Texas [4]	387	136
MOUNTAIN		
Montana	5	4
Idaho	9	0
Wyoming	2	8
Colorado	55	12
New Mexico	14	60
Arizona	33	12
Utah [3]	120	79
Nevada	6	
PACIFIC		
Washington	73	26
Oregon	15	26
California	259	153
Total	3,679	2,865
weeks	29,113	19,585

[1] New York City only.
[2] Report for 4 days.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended February 15, 1941, 24 cases, as follows: North Carolina, 2; South Carolina, 1; Georgia, 9, Florida, 4; Alabama, 2; Louisiana, 3; Texas, 3.
[5] Delayed reports of approximately 700 cases included.

WEEKLY REPORTS FROM CITIES

City reports for week ended February 1, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Data for 90 cities:											
5-year average	161	1,379	142	3,188	925	1,775	34	371	17	1,094	-------
Current week [1]	65	5,849	194	6,009	777	1,077	5	347	24	1,223	-------
Maine											
Portland	0	------	0	0	9	0	0	1	0	13	30
New Hampshire.											
Concord	0	------	0	0	0	0	0	0	0	0	19
Manchester	0	------	3	0	3	1	0	1	0	0	40
Nashua	0	------	0	0	2	0	0	0	0	0	14
Vermont											
Barre	0	------	0	0	0	0	0	1	0	0	3
Burlington	0	------	0	4	0	0	0	0	0	0	10
Massachusetts:											
Boston	1	------	3	138	14	33	0	8	1	75	284
Fall River	1	------	0	0	3	6	0	2	0	5	49
Springfield	0	------	0	0	2	17	0	1	1	0	36
Worcester	0	------	0	64	6	2	0	2	0	0	57
Rhode Island											
Pawtucket	0	------	0	0	0	1	0	0	0	0	27
Providence	0	23	0	0	13	8	0	4	0	10	116
Connecticut											
Bridgeport	0	4	2	0	7	0	0	0	0	3	42
Hartford	0	5	2	0	5	1	0	0	0	3	52
New Haven	0	13	2	0	5	11	0	1	3	8	50
New York:											
Buffalo	0	13	7	63	22	20	0	8	1	15	171
New York	13	632	9	1,943	120	199	0	60	4	110	1,633
Rochester	0	------	0	8	8	0	0	1	0	11	94
Syracuse	0	------	0	0	4	0	0	0	0	19	69
New Jersey											
Camden	1	20	3	64	2	3	0	2	0	10	34
Newark	0	86	0	121	10	39	0	6	0	10	105
Trenton	0	47	2	6	15	57	0	1	0	4	53
Pennsylvania											
Philadelphia	0	23	12	750	56	69	0	30	1	48	640
Pittsburgh	0	20	7	1	31	7	0	10	0	44	224
Reading	0	3	5	183	1	0	0	2	0	7	39
Ohio:											
Cincinnati	3	29	2	24	11	10	0	7	0	0	152
Cleveland	0	518	5	533	22	26	0	4	0	114	240
Columbus	0	5	5	32	11	13	0	1	0	20	115
Toledo	0	2	1	2	6	6	0	1	0	17	63
Indiana.											
Anderson	0	------	0	0	1	2	0	0	0	0	18
Fort Wayne	1	------	0	19	5	0	0	1	0	0	34
Indianapolis	2	------	2	7	21	17	0	1	0	5	119
Muncie	0	------	0	4	5	4	0	0	0	0	20
South Bend	0	------	0	7	0	1	0	0	0	0	12
Terre Haute	0	------	1	0	1	0	0	0	0	0	10
Illinois:											
Alton	0	1	1	0	2	3	0	0	0	0	9
Chicago	9	44	6	998	39	169	0	30	0	77	782
Elgin	0	------	0	15	0	0	0	0	0	0	4
Moline	0	------	0	3	0	2	0	0	0	0	13
Springfield	0	------	0	0	6	8	0	0	0	2	25
Michigan:											
Detroit	2	95	7	548	22	95	0	10	0	130	306
Flint	0	------	4	40	7	2	0	0	0	12	35
Grand Rapids	0	2	2	10	2	2	0	1	0	14	42
Wisconsin:											
Kenosha	0	------	0	50	0	0	0	0	0	0	7
Madison	0	------	0	1	0	2	0	0	0	2	11
Milwaukee	0	2	0	43	4	29	0	2	0	45	98
Racine	0	------	0	3	0	3	0	0	0	3	11
Superior	0	------	0	1	3	1	1	0	0	0	16
Minnesota:											
Duluth	0	------	1	1	5	0	1	0	0	6	29
Minneapolis	0	1,958	1	1	10	9	0	2	0	40	157
St. Paul	0	------	0	1	8	8	0	0	0	7	70

City reports for week ended February 1, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0	-----	0	0	0	3	0	0	0	0	-----
Davenport	0	-----	-----	0	-----	1	0	-----	0	0	-----
Des Moines	2	-----	0	0	0	5	0	0	0	9	27
Sioux City	1	-----	-----	0	-----	0	0	-----	0	4	-----
Waterloo	0	-----	-----	0	-----	2	0	-----	0	4	-----
Missouri:											
Kansas City	2	1	0	3	8	8	1	2	0	16	105
St. Joseph	0	-----	1	0	7	1	0	1	0	1	32
St. Louis	0	45	2	8	14	41	0	4	0	23	209
North Dakota:											
Fargo	0	-----	-----	0	-----	0	0	-----	0	2	-----
Grand Forks	0	-----	-----	0	-----	0	0	-----	0	0	-----
Minot	0	-----	0	2	0	0	0	0	0	1	7
South Dakota:											
Aberdeen	0	-----	-----	0	-----	1	0	-----	0	1	-----
Sioux Falls	0	-----	0	0	0	2	0	0	0	0	9
Nebraska:											
Lincoln	0	-----	-----	2	-----	3	0	-----	0	3	-----
Omaha	0	-----	3	0	2	3	1	2	0	1	61
Kansas:											
Lawrence	0	27	0	7	0	0	0	0	0	0	3
Topeka	0	12	2	25	5	2	0	1	0	0	42
Wichita	0	1	0	1	4	3	0	3	0	17	34
Delaware:											
Wilmington	2	-----	0	16	8	3	0	2	0	9	45
Maryland:											
Baltimore	0	65	7	4	15	33	0	15	2	74	282
Cumberland	0	2	1	0	0	2	0	0	0	1	14
Frederick	0	-----	0	0	0	0	0	0	0	0	6
Dist. of Col.:											
Washington	2	124	5	14	33	16	0	15	0	8	237
Virginia:											
Lynchburg	1	-----	0	0	2	0	0	0	0	0	16
Norfolk	0	281	0	2	5	2	0	3	0	3	43
Richmond	0	506	4	6	8	0	0	2	0	1	73
Roanoke	1	-----	3	155	0	1	0	0	0	2	14
West Virginia:											
Charleston	0	-----	0	1	11	0	0	1	0	3	49
Huntington	0	-----	-----	0	-----	0	0	-----	0	0	-----
Wheeling	0	-----	2	0	3	1	0	1	1	12	24
North Carolina:											
Gastonia	0	1	-----	2	-----	0	0	-----	0	2	-----
Raleigh	0	-----	1	2	3	0	0	1	0	12	34
Wilmington	0	-----	0	1	2	0	0	0	0	0	15
Winston-Salem	0	-----	0	0	1	2	0	1	0	31	21
South Carolina:											
Charleston	0	505	4	10	9	2	0	0	0	0	34
Florence	0	165	0	17	0	0	0	0	0	0	3
Greenville	0	-----	0	5	2	1	0	0	0	13	12
Georgia:											
Atlanta	0	71	2	7	9	6	0	5	1	3	94
Brunswick	0	1	1	0	1	0	0	1	0	0	6
Savannah	0	145	2	0	2	1	0	-----	0	0	28
Florida:											
Miami	1	27	2	0	2	1	0	3	0	1	56
Tampa	0	4	4	0	3	0	0	1	0	0	20
Kentucky:											
Ashland	0	8	1	0	1	1	0	2	0	3	11
Covington	0	5	0	11	2	0	0	1	0	1	14
Lexington	0	-----	0	9	5	1	0	3	0	1	23
Louisville	0	51	1	11	8	20	0	3	0	14	83
Tennessee:											
Knoxville	0	30	6	2	10	3	0	1	1	13	54
Memphis	0	30	8	9	5	9	0	5	0	3	85
Nashville	0	-----	4	6	6	0	0	2	0	15	78
Alabama:											
Birmingham	2	515	10	16	10	4	0	5	0	5	102
Mobile	0	19	6	1	4	2	0	3	0	0	37
Montgomery	0	25	-----	0	-----	0	0	-----	0	4	-----
Arkansas:											
Fort Smith	0	-----	-----	0	-----	0	0	-----	0	0	-----
Little Rock	0	35	0	16	6	0	0	1	0	0	28

City reports for week ended February 1, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	-----	0	0	2	0	0	0	0	0	6
New Orleans	3	32	5	2	18	5	0	16	4	5	166
Shreveport	0	-----	0	0	4	1	1	2	0	0	47
Oklahoma											
Oklahoma City	0	16	1	0	2	4	0	0	0	0	40
Tulsa	1	-----	0	1	4	4	0	0	0	5	24
Texas:											
Dallas	1	4	4	0	6	7	0	1	1	0	71
Fort Worth	0	-----	3	72	8	4	0	1	0	0	53
Galveston	0	-----	0	16	3	1	0	1	2	0	16
Houston	4	6	2	1	8	1	0	7	0	2	104
San Antonio	2	11	3	0	8	3	0	5	0	2	66
Montana											
Billings	0	-----	0	0	0	0	0	0	0	0	10
Great Falls	1	-----	0	1	3	2	0	0	0	0	12
Helena	0	-----	0	0	1	0	0	0	0	0	4
Missoula	0	10	0	0	1	2	0	0	0	0	15
Idaho											
Boise	0	-----	0	0	2	2	0	0	0	0	4
Colorado											
Colorado Springs	0	-----	1	0	0	1	0	0	0	12	8
Denver	7	55	8	5	11	3	0	3	1	12	106
Pueblo	1	-----	3	1	1	0	0	0	0	3	14
New Mexico:											
Albuquerque	0	-----	0	1	3	0	0	3	0	0	11
Utah											
Salt Lake City	1	-----	0	6	0	3	0	0	0	4	37
Washington:											
Seattle	0	-----	1	6	2	2	0	3	0	13	87
Spokane	0	1	-----	1	-----	1	0	-----	0	0	-----
Tacoma	0	-----	0	0	1	1	0	0	0	0	21
Oregon											
Portland	0	5	0	11	4	1	0	4	0	0	84
Salem	0	1	-----	2	-----	2	0	-----	0	0	-----
California:											
Los Angeles	2	91	4	7	4	32	0	20	0	33	361
Sacramento	0	4	2	0	4	3	0	1	0	1	35
San Francisco	0	12	0	3	9	3	0	13	1	39	216

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Connecticut:				South Carolina:			
Bridgeport	1	1	0	Charleston	3	0	0
New York:				Florida:			
New York	1	2	1	Miami	1	0	0
Pennsylvania:				Tennessee:			
Pittsburgh	1	0	0	Knoxville	1	0	0
Indiana				Nashville	1	1	0
Indianapolis	1	0	0	Alabama:			
Illinois:				Birmingham	1	0	0
Chicago	0	0	1	Louisiana:			
Missouri:				Shreveport	1	1	0
St. Louis	0	0	1	Texas:			
West Virginia:				Houston	1	0	0
Wheeling	0	1	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Denver, 2.
Pellagra.—Cases: Boston, 1; Charleston, S. C., 1; Atlanta, 1; Savannah, 1; Knoxville, 1.
Typhus fever.—Cases: New York, 1; Atlanta, 1; Savannah, 1; New Orleans, 2.

FOREIGN REPORTS

CANADA

Increase in cerebrospinal meningitis.—An increase in the incidence of cerebrospinal meningitis has been reported in Canada, beginning with the first week of October 1940. From the week ended October 5, 1940, to the week ended January 18, 1941, a total of 316 cases had been reported as compared with 47 cases for the corresponding period of 1939–40. The Provinces reporting the largest numbers of cases were Ontario (117), Nova Scotia (54), and Quebec (55).

Provinces—Communicable diseases—Week ended January 11, 1941.—During the week ended January 11, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	4	9	4	14	20	1		3	7	62
Chickenpox		21		78	454	51	17	72	98	791
Diphtheria		42	2	15	2	6		2		69
Dysentery				2						2
Influenza		380			303	6	102		500	1,291
Measles		460	26	21	677	154	55	282	573	2,248
Mumps				47	99	14	2	10	26	198
Pneumonia		15			30	1	2		14	62
Poliomyelitis				1	1					2
Scarlet fever	1	43	8	53	148	9	8	13	17	300
Tuberculosis	1	7	9	17	45	5				84
Typhoid and paratyphoid fever			1	8					1	10
Whooping cough		4		49	134	20	7	5	9	228

CUBA

Provinces—Notifiable diseases—4 weeks ended January 4, 1941.—During the 4 weeks ended January 4, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	4			10		9	23
Diphtheria	8	37	5	8		9	67
Hookworm disease		22		3			25
Leprosy						5	5
Malaria	4	6		9	3	204	226
Poliomyelitis		1					1
Scarlet fever		4		2			6
Tuberculosis	29	56	17	59	4	33	198
Typhoid fever	22	34	4	15	13	25	113

[1] Includes the city of Habana.

SWITZERLAND

Notifiable diseases—September 1940.—During the month of September 1940, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Anthrax	1	Paratyphoid fever	11
Cerebrospinal meningitis	27	Poliomyelitis	44
Chickenpox	93	Scarlet fever	332
Diphtheria	52	Tuberculosis	201
German measles	8	Typhoid fever	13
Measles	88	Undulant fever	11
Mumps	39	Whooping cough	139

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of January 31, 1941, pages 206-210. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Morocco.—During the week ended February 1, 1941, 64 cases of plague were reported among the tribes of the Agadir Territory and the Marrakesh region, Morocco.

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Public Health Reports

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IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

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Public Health Reports

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DOMESTIC WATER AND DENTAL CARIES

I. A Dental Caries Study, Including *L. Acidophilus* Estimations, of a Population Severely Affected by Mottled Enamel and Which for the Past 12 Years Has Used a Fluoride-Free Water [1]

By H. Trendley Dean, *Dental Surgeon*, Philip Jay, *Consultant*,[2] Francis A. Arnold, Jr., *Passed Assistant Dental Surgeon*, and Elias Elvove, *Senior Chemist, United States Public Health Service*

Epidemiological evidence points to an inverse relationship between endemic dental fluorosis (mottled enamel) and dental caries (*1, 2, 3, 4*). Recent reviews (*5, 6*) have discussed many of the epidemiological, biochemical, bacteriological, and experimental aspects of this phenomenon, but its mechanism is not, as yet, clear. Whether or not this inhibitory agent operates locally, systemically, or even involves structural or compositional factors is still undetermined. Recent studies (*7, 8, 9, 10, 11, 12, 13*) shed some light on certain aspects of the essential points involved.

For the purpose of possibly clarifying several of these questions, insofar as they relate to human populations, quantitative epidemiological studies were planned, involving (*a*) populations exposed to waters of a relatively high fluoride concentration during the period of tooth calcification followed by exposure, during the post-eruptive period, to waters free of fluorides; and (*b*) populations whose teeth calcified while using waters free of fluorides followed, during the post-eruptive tooth period, by exposure to waters whose fluoride (F) content exceeded the minimal threshold of endemic dental fluorosis, one part per million.

This report describes a study embodying many of the requisites of this first desideratum. A subsequent paper in this series will record the results of a study in which an almost opposite set of conditions prevailed.

This study was made at Bauxite, Ark., a community which has occupied a prominent place in mottled-enamel history. In 1928 Kempf

[1] From the Division of Infectious Diseases with the cooperation of the Division of Chemistry, National Institute of Health.

[2] Assistant Professor, University of Michigan School of Dentistry.

and McKay (*14*) conducted a mottled-enamel study of this community and recorded an incidence of affection of 100 percent. The public water supply at that time was obtained from deep wells and was subsequently found to contain one of the highest fluoride concentrations of any known common water supply in the United States, close to 14 parts per million. As might be expected, an unusually severe type of mottled enamel had developed in the community. A few months after the 1928 survey, Bauxite changed its public water supply from that of the deep wells to a water obtained from the nearby Saline River, a water free of fluorides and which had been used by the nearby city of Benton for a number of years.

1938 BAUXITE SURVEY

Approximately 10 years after the change in the water supply, the children of Bauxite were resurveyed by Dean, McKay, and Elvove (*15*). Briefly, their study showed that the older children, whose permanent teeth had calcified while they were using the "old," or deep-well supply, showed moderate to severe types of mottled enamel, while those children born subsequent to the change in the water supply were practically free of mottled enamel. For details of this study the original report (*15*) should be consulted.

The dental conditions of the 106 Bauxite school children (ages 6–15 years) were examined independently [3] by each of the field examiners (H. T. D. and F. S. McK.). All examinations were made with the aid of mouth mirrors and explorers. In addition to the enamel hypoplasia characteristic of endemic dental fluorosis (mottled enamel), other dental pathology such as dental caries (treated and untreated), missing teeth, and types of enamel hypoplasia other than mottled enamel, were recorded. Following the clinical examination, the home of each child was visited and the parent interviewed regarding the type of domestic water used by the child throughout life. This house-to-house recheck resulted in the elimination of the schedules of 24 children whose histories indicated the use of a domestic water, other than the Bauxite communal water supply, for a period exceeding 30 days in any calendar year. After the house-to-house check there remained 82 children whose history, confirmed by the parents, indicated continuous exposure to the Bauxite communal water supply.

Because of the complementary nature of the unpublished dental caries data from the 1938 mottled enamel study of Dean and McKay, a brief analysis of their findings, together with a short reference to certain epidemiological constants, is introduced as a means of aiding

[3] In independent dental examinations it is obvious that no two dental examiners will be in complete agreement with respect to all teeth diagnosed as carious. This is especially true in communities characterized by low dental caries experience rates where oftentimes pits and fissures introduce an important problem of subjective assessment. Table 1 therefore reports only those teeth on which both examiners were in agreement.

in a clearer conception of the findings of a study made at Bauxite in April 1940. In the epidemiology of dental caries it is generally accepted that under normal conditions the dental caries experience rates[4] bear a direct relationship to the number of years of exposure to the risk of dental caries. Since dental caries is a lesion incapable of self-repair, the dental caries experience rates for any single age group represent the dental caries experience of that group cumulative through the post-eruptive period, or period of exposure (*cf.* the number of DMF teeth per 100 cases, table 1 of reference *16*).

The amount of dental caries experienced by deciduous teeth cannot be determined by a single clinical examination with the same quantitative precision as that for permanent teeth, since it is not possible to determine whether missing deciduous teeth were lost because of dental caries, or as a result of normal physiological exuviation. It does not seem illogical, however, to assume that years of post-eruptive exposure bear a somewhat similar relationship to the amount of dental caries in the deciduous teeth present as has been observed in the permanent teeth.

An analysis,[5] therefore, was made of the amount of dental caries in the deciduous molars and the first permanent molars of the 82 children with verified continuity of exposure to the Bauxite common water supply. All missing deciduous molars were excluded from the tabulations for the reason previously stated, and the percentage incidence of dental caries affection was based upon the number of teeth actually present in the mouth.[6] Missing permanent first molars, of which there were two, were assumed to have been lost as a result of dental

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[4] The term "dental caries experience" was introduced by Klein and Palmer (Pub Health Rep, 55 187-205 (Feb 2, 1940), and earlier articles referred to in this reference) who state that "a reconstitution of the caries experience in the permanent teeth of children may be accomplished with a fair degree of precision by totaling the *mutually exclusive* numbers of carious teeth (irrespective of the number of defects per tooth), the number of filled teeth, and the number of extracted teeth plus those indicated for extraction. The summation of these values gives a count of the number of permanent teeth showing evidence of having been attacked by caries; * * *." When it is desired to express dental caries experience as a rate per 100 children, the sum of the four aggregates referred to (number of teeth with untreated dental caries, filled teeth, extracted teeth, and those indicated for extraction) is divided by the number of children examined and the quotient multiplied by 100.

In the reference cited above, attention is also called to the fact that teeth with evidence of caries experience have been designated by various other terms. Salzman, for instance, uses the expression "ex-teeth," while Hollander and Dunning refer to them as "affected teeth."

[5] The limited number of children available for study (82), distributed over a wide age group (6-15 years), a period when the permanent dentition is subject to varying changes because of the eruption of the permanent teeth, precludes a computation of dental caries experience rates. In the instance of the 1938 data, therefore, study of the dental caries experience is limited to such constants as the deciduous molars present and the first permanent molars, the results being reported on the basis of the percentage incidence of dental caries experience.

[6] In a community where the clinical examinations indicate an average amount of reparative dental care (fillings, etc.), it may be assumed that a portion, at least, of the population has recourse to dental practitioners for alleviation of their dental needs. Under such conditions it is possible that certain deciduous molars with advanced dental caries may have been extracted by a dentist prior to the time that the tooth would have been normally exuviated. In these 82 children, however, not a single instance of a filled tooth, deciduous or permanent, was noted and one would seem warranted in assuming that in this particular group practically all missing deciduous molars were lost as a result of normal physiological exuviation.

caries; three other first permanent molars showing extensive carious involvement were diagnosed as "extraction indicated."

The dental caries findings of the 1938 study are summarized in table 1. While the number of observations is small there seems to be an inverse relationship between the amount of dental caries and exposure to the "old" common water supply with the high fluoride content. The Bauxite population prior to May 1928 had been exposed to a fluoride intake of unusually high concentration and it would seem that the physiological effects, insofar as they relate to the inhibitory influence on dental caries, had carried over for several years after the change to the fluoride-free river water.

TABLE 1.—*Summary of dental caries findings in 82 Bauxite (Ark.) children with verified continuity of exposure to the common water supply according to the 1938 survey of Dean and McKay*

	Born subsequent to water change				Born prior to water change						Total
Age	6	7	8	9	10	11	12	13	14	15	---
Number of children	5	14	8	13	5	7	6	10	7	7	82
	Deciduous molars [1]										
Number of children with deciduous molars present	5	14	8	13	5	5	3	2	1	1	[3] 57
Number of deciduous molars present in which both examiners' diagnoses agreed	39	104	59	82	27	[2] 16	9	10	2	2	[3] 350
Number of deciduous molars with dental caries experience [1]	14	38	11	20	4	2	0	0	0	0	89
Percent with dental caries experience	36		22		9						------
	29										
Approximate number of years of exposure to risk of caries	4.7		6.6		9.2						------
	First permanent molars										
Number of first permanent molars in which examiners' diagnoses of caries agreed	18	50	28	40	18	25	16	36	24	26	[4] 281
Number of first permanent molars with dental caries experience	2	27	14	17	3	5	6	21	19	9	[4] 123
Percent with dental caries experience	42		46		24			57			
	44				43						
Approximate number of years of exposure to risk of caries	----	1	2	3	4	5	6	7	8	9	------
	1.7				6.7						
Mottled enamel diagnosis of those first permanent molars referred to above:											
Number	18	50	28	40	18	25	16	36	24	26	------
Negative	18	46	28	35	18	20	7	7	0	0	------
Questionable	0	2	0	3	0	4	2	3	0	0	------
Mottled enamel	0	2	0	2	0	1	7	23	23	26	------
Missing, no diagnosis, etc	0	0	0	0	0	0	0	3	1	0	------

[1] Missing deciduous molars excluded from these tabulations.

[2] Two of these molars were diagnosed as "questionable" mottled enamel; no positive diagnoses of mottled enamel were made in any of the deciduous molars in this entire group.

[3] In these 57 children, 368 deciduous molars were present. Both examiners were in agreement as to the presence or absence of dental caries in 350, or approximately 95 percent, of the cases.

[4] In the 82 children in this group there were 328 first permanent molars. For purposes of determining dental caries experience, two molars extracted because of caries were included in the total. The examiners' diagnoses were in agreement in 281, or approximately 86 percent, of the cases.

N. B. Ages 2½ years for deciduous molars and 6½ years for first permanent molars were selected as the time of eruption upon which years of exposure to risk were computed. The limited number of observations did not warrant a separate break-down for the first and second deciduous molars.

In table 1 the incidence of dental caries in deciduous molars does not show the cumulative increase concomitant with increasing years

of exposure. It actually reverses this trend; the highest incidence is observed in the youngest age group, but this group is farthest removed in point of time from the influence of the "old" high fluoride domestic water.

With approximately 9 years of exposure to the risk of dental caries, only 6 deciduous molars were carious, or 9 percent of the 66 deciduous molars present in the 17 children born prior to the change in the water supply. In 21 children born within a year or two after the change to the river water and whose deciduous molars had approximately 6½ years of exposure to the risk of dental caries, 31 were carious, or about 22 percent of the 141 deciduous molars present. And in 19 children born 3 and 4 years after the water change and with the shortest period of exposure to the risk, approximately 4½ years, 52 of these teeth showed carious involvement, or about 36 percent of the 143 deciduous molars present. The incidence of dental caries in the first permanent molars in the group born prior to the change in the water supply was no greater than that recorded in the group born subsequent to the change, irrespective of the fact that the exposure in the former group was nearly four times that of the latter group.

Statistical analyses of the differences in the observed rates of the 1938 survey, and also the 1940 study, were made and are shown in tables 1A and 2A. Attention is called to the fact that the critical ratios as shown apply to the observed caries experience only. In interpreting these ratios the greater or lesser years of exposure to the risk of dental caries should also be considered as an important variable.

1940 BAUXITE SURVEY

During the past two years much attention has been focused on the probable relationship of fluorine to dental caries. Continuing epidemiological studies have shown a markedly lessened prevalence of dental caries in communities where the fluoride (F) concentration of the public water supply is slightly over the minimal threshold for endemic dental fluorosis, one part per million.

Although the number of school children available for study at Bauxite was limited,[7] this community seemed to offer some possibility of studying the mechanism of this phenomenon under the conditions of changed exposure to domestic waters differing widely in fluoride concentration. Primarily, the study was planned to determine the amount of dental caries in a population having a moderate to severe type of mottled enamel but which for the past 12 years had been consuming a domestic water free of fluorides. It seemed important also to include an estimation of the number of oral *L. acidophilus* in the saliva of as many as possible of the children included in the study.

[7] The general population of Bauxite is estimated at about 1,900.

Table 1A.—*Test of statistical significance of differences noted in the percentage of deciduous molars showing dental caries experience and first permanent molars showing dental caries experience among Bauxite (Ark.) children born subsequent to and prior to the change in the common water supply.*

[Based on table 1]

Group	Deciduous molars			First permanent molars		
	Percentage showing dental caries experience	Is the difference between the indicated pairs of percentages statistically significant?	Critical ratio[1]	Percentage showing dental caries experience	Is the difference between the indicated pairs of percentages statistically significant?	Critical ratio[1]
1. 40 children born subsequent to the water change (ages 6–9)	29	(1) and (2), yes	4.51	44	(1) and (2), no	0 17
2. 42 children born prior to the water change (ages 10–15).	9	(2) and (1), yes	4.51	43	(2) and (1), no	.17
3. 19 children born subsequent to the water change (ages 6–7).	36	(3) and (4), yes	2.63	42	(3) and (4), no (3) and (5), yes (3) and (6), no	.47 2.20 1 87
4. 21 children born subsequent to the water change (ages 8–9).	22	(4) and (3), yes	2 63	46	(4) and (3), no (1) and (5), yes (4) and (6), no	47 2 68 1 36
5. 18 children born prior to the water change (ages 10–12).	-------	-------------------	-------	24	(5) and (3), yes (5) and (4), yes (5) and (6), yes	2 20 2 68 4 28
6. 24 children born prior to the water change (ages 13–15).	-------	-------------------	-------	57	(6) and (3), no (6) and (4), no (6) and (5), yes	1 87 1 36 4 28

[1] A critical ratio of 2 or more is generally accepted as indicating a difference that is statistically significant, that is, the difference is unlikely to be due to chance. In terms of probability it may be stated that a critical ratio of 2 denotes that a difference as great or greater than the one found may occur by chance only 4.5 times in 100 trials, for critical ratios of more than 2 the probability is even less than 4.5. Thus, when the critical ratio is 2 or more the cause or causes of the difference may be assigned to factors other than chance. (Compare, Pearl, R. Introduction to Medical Biometry and Statistics, 2d ed., W. B. Saunders Co., Philadelphia, 1938. Table B, page 439.)

METHOD OF SAMPLING

The population studied was divided[8] in the following manner:

Group 1.—This division constituted the basic study group and consisted of all Bauxite pupils present on the day of sampling who had developed mottled enamel while using the "old" Bauxite water supply. They were mostly pupils in the high school and the higher elementary grades and ranged in age from 14 to 22 years. This group consisted of 50 individuals, 26 of whom gave a history of continuous exposure to the Bauxite common water supply. The remaining 24 were persons who had also developed mottled enamel while using the "old" Bauxite water but whose water histories included minor breaks in continuity of exposure. Attention is particularly called to the fact that all in this group showed a relatively moderate to severe type of mottled enamel. Group 1 is shown in table 2 under section B.

[8] All sampling was conducted by one of us (H. T. D.).

Group 2.—This group consisted of 49 children, ages 8–13 years, with a history of continuous use of the Bauxite common water supply. Included were 26 children, ages 8–10, born more than 1½ years after the change in the water supply, and 23 children, ages 11–13 years, born within 1½ years of the water change. This latter group of 23 children is designated in table 2, section A, as the "transitional group." Among these 49 children, two cases of "very mild" mottled enamel were observed. For purposes of convenience section A of table 2 also lists older pupils with a history of continuous use of the Bauxite common water supply. The older age group, 14–19 years, shown in section A is composed of the 26 pupils referred to in group 1 as those having continuously used the Bauxite water supply.

Group 3.—In order to have a group roughly comparable in age to group 1 (section B of table 2) all Benton (Ark.) high school pupils with a history of continuous use of the Benton common water supply were examined. There were 45 pupils in this group. As has been previously noted, the Bauxite group who had developed mottled enamel while using the "old" high fluoride water (table 2, section B) had been using Saline River water for the past 12 years only; the Benton group (section C of table 2) had used Saline River water throughout life. No mottled enamel was observed in any of the Benton pupils.

CLINICAL AND BACTERIOLOGICAL FINDINGS

The clinical examinations and the bacteriological estimations were made by Consultant Philip Jay (assistant professor, University of Michigan School of Dentistry) and Passed Assistant Dental Surgeon F. A. Arnold, Jr., United States Public Health Service. A mouth mirror and double end No. 3 explorer were used in making all clinical examinations. These examinations were not made independently as in the case of Dean and McKay (table 1) but each child was examined by the two examiners. When it was questionable as to whether a lesion was to be classified as dental caries or not, agreement between examiners was reached at the time of the examination and the diagnosis in which both concurred was recorded.[9] All mottled enamel diagnoses were made by Passed Assistant Dental Surgeon Arnold. The findings with respect to dental caries experience, using the first permanent molars for comparison, are shown in table 2.

[9] Comparison of incidences of dental caries in single age groupings or combinations of similar age groupings should not be made between the 1938 and the 1940 survey for the reason that the clinical examinations were made by different examiners. Under such conditions, and especially with regard to the pits and fissures observed in endemic areas of dental fluorosis, the inherent variation associated with subjective assessment results in some individual differences in the diagnosis of dental caries.

TABLE 2.—*Dental caries findings in Bauxite (Ark.) elementary and high school pupils with and without mottled enamel and exposed to a fluoride-free water for the past 12 years, and in Benton (Ark.) high school pupils exposed to a fluoride-free water throughout life. (Survey made April 22–27, 1940)*

Age in years, last birthday	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
A. 75 BAUXITE (ARK.) PUPILS WITH HISTORY OF CONTINUOUS USE OF COMMON WATER SUPPLY																
	26 pupils using fluoride-free water throughout life A-1			23 pupils of transitional group [1] A-2			26 pupils using fluoride-free water past twelve years only; high fluoride water previously A-3									Total
Number of pupils examined	3	15	8	11	7	5	3	3	6	6	7	1	0	0	0	75
First permanent molars																
Number (missing included)	12	60	32	44	28	20	12	12	24	24	28	4	----	----	---	300
Number showing dental caries experience	6	47	15	21	9	1	3	3	15	7	10	3	----	----	----	140
Percent showing dental caries experience		65			34		25		46		39		41			
Number of pupils, caries free	1	1	2	2	4	4	1	2	0	3	1	0	---	----	----	--
Percent of pupils, caries free		15			43		50		25		27		13			
Approximate number of years of risk of exposure to caries		3.2			5.7						10.5					
Mottled enamel																
Number of pupils with	0	1	0	0	1	0	3	3	6	6	7	1	----	----	----	------
Degree of clinical affection (weighted average) [2]	0	0.1	0	0	0.2	0	2.7	3.7	3.8	3.2	3.7	4.0	---	--	---	------
B. 50 BAUXITE (ARK.) PUPILS SHOWING A RELATIVELY MODERATE TO SEVERE TYPE OF MOTTLED ENAMEL. GROUP CONSISTS OF 26 OF "A 3" ABOVE AND 24 OTHERS WITH MINOR VARIATIONS IN CONTINUITY OF USE OF PUBLIC WATER SUPPLY																
Number of pupils examined							4	8	12	9	9	4	3	0	1	50
First permanent molars																
Number (missing included)							16	32	48	36	36	16	12	0	4	200
Number showing dental caries experience							3	12	32	11	17	7	0	----	1	83
Percent showing dental caries experience							31		51		42		37			
Number of pupils, caries free							2	3	0	4	1	2	3	----	0	15
Percent of pupils, caries free											30					
Approximate number of years of risk of exposure to dental caries											10.8					
Mottled enamel																
Number of pupils with							4	8	12	9	9	4	3	----	1	------
Degree of clinical affection (weighted average) [2]							3.0	3.0	3.8	3.1	3.8	3.5	3.7	--	4.0	------
C. 45 BENTON (ARK.) HIGH SCHOOL PUPILS WITH A HISTORY OF CONTINUOUS USE OF THE COMMON WATER SUPPLY. (NO CHANGE OCCURRED IN BENTON WATER SUPPLY DURING LIFETIME OF THIS GROUP)																
Number of pupils examined							11	9	10	9	4	0	1	1	0	45
First permanent molars																
Number (missing included)							44	36	40	36	16	----	4	4	----	180
Number showing dental caries experience							30	27	20	33	13	----	0	1	----	124
Percent showing dental caries experience							71		70		69		58			
Number of pupils, caries free							1	1	3	0	0	----	1	0	----	6
Percent of pupils, caries free											13					
Approximate number of years of risk of exposure to dental caries											9.9					
Mottled enamel																
Number of pupils with							0	0	0	0	0	----	0	0	----	------
Degree of clinical affection (weighted average) [2]							0	0	0	0	0	----	0	0	----	------

[1] The public water supply at Bauxite was changed from deep well to filtered river water in May 1928; the "transitional group" includes those pupils born within 1½ years of the change in water supply (a 3-year period covering 1½ years prior to the change and 1½ years subsequent to the change).

[2] The following weights were given to the diagnosis recorded for each individual: normal, 0; questionable, 0.5; very mild, 1; mild, 2; moderate, 3, severe, 4.

TABLE 2A.—*Test of statistical significance of differences noted in the percentage (a) of first permanent molars showing dental caries experience and (b) of pupils with caries free, first permanent molars, among certain groups of Bauxite and Benton (Ark.) school children*

[Based on table 2]

Group	First permanent molars			Pupils examined		
	Percentage showing dental caries experience	Is the difference between the indicated pairs of percentages statistically significant?	Critical ratio [1]	Percentage of pupils, caries free, first permanent molars	Is the difference between the indicated pairs of percentages statistically significant?	Critical ratio [1]
A-1. 26 Bauxite pupils using river water throughout life (ages 8-10).	65	A-1 and A-2, yes A-1 and A-3, yes A-1 and B, yes A-1 and C, no	4.56 3.89 3.94 .69	15	A-1 and A-2, yes A-1 and A-3, no A-1 and B, no A-1 and C, no	2.25 1.07 1.57 .23
A-2. 23 Bauxite pupils of the "transitional group" (ages 11-13).	34	A-2 and A-1, yes A-2 and A-3, no A-2 and B, no A-2 and C, yes	4.56 .73 1.32 5.81	43	A-2 and A-1, yes A-2 and A-3, no A-2 and B, no A-2 and C, yes	2.25 1.19 1.07 2.61
A-3. 26 Bauxite pupils using river water during the past 12 years only, deep well water previously (ages 14-22)	39	A-3 and A-1, yes A-3 and A-2, no A-3 and C, yes	3.89 .73 5.09	27	A-3 and A-1, no A-3 and A-2, no A-3 and C, no	1.07 1.19 1.39
B. 50 Bauxite pupils showing a relatively moderate to severe mottled enamel (includes A-3 plus 24 others with some variation in use of water supply)	42	B and A-1, yes B and A-2, no B and C, yes	3.94 1.32 5.50	30	B and A-1, no B and A-2, no B and C, yes	1.57 1.07 2.08
C. 45 Benton pupils with a history of continuous use of the common water supply (No changes in this supply throughout lifetime of group)	69	C and A-1, no C and A-2, yes C and A-3, yes C and B, yes	.69 5.81 5.09 5.50	13	C and A-1, no C and A-2, yes C and A-3, no C and B, yes	.23 2.61 1.39 2.08

[1] See footnote, table 1A.

Ordinarily dental caries experience rates are not determined for such small groups, 50 and 45 individuals, or for even much larger groups with such wide age distributions as shown in sections B and C of table 2. But with the reservation implied when dealing with a sample of this nature, the dental caries experience rate, for the permanent teeth, in the 50 Bauxite pupils with mottled enamel was 314 per 100 children; the 45 Benton pupils with no mottled enamel showed a rate of 675. The data upon which these rates are based are shown in table 3.

A previous study (*2*) has shown that the use of a domestic water with a fluoride concentration (1.8 p. p. m.) not greatly in excess of the minimal threshold for endemic dental fluorosis (1.0 p. p. m.) was associated with unusually low oral lactobacilli counts. Whether the observed effects were the result of local, systemic, or even structural or compositional factors in the teeth themselves is not known. Bauxite presented the opportunity of studying bacteriologically a group of children whose teeth were moderately to severely affected by mottled

enamel (an enamel which presumably should contain a higher than average fluorine content (*17*)), but who had not used the high fluoride water for the past 12 years. To ascertain whether or not such teeth, with presumably a high fluorine content of the enamel, would be found associated with a lowered number of lactobacilli in the saliva seemed an important step in the attempt to elucidate the manner in which this mechanism operates. For this purpose stimulated saliva samples were collected from 140 of the 149 pupils examined at Bauxite and Benton and quantitative estimations of the number of oral *L. acidophilus* were made by two of the authors (P. J. and F. A. A.). The technique used was similar to that described by Jay (*18*), making equal dilutions of all salivas before plating (1 cc. saliva to 4 cc. broth). The results of the bacteriological study are shown in table 4.

TABLE 3.—*Distribution of the dental caries experience, permanent teeth, in the Bauxite group with mottled enamel (section B, table 2) and the Benton group with no mottled enamel (section C, table 2) (1940 survey)*

Place	Number of pupils examined	Untreated dental caries	Past dental caries (fillings)	Extraction indicated	Missing	Total dental caries experience
		Number				
Bauxite	50	107	21	0	29	157
Benton	45	179	72	11	42	304
		Number per 100 cases				
Bauxite		214	42	0	58	314
Benton		398	160	24	93	675

TABLE 4.—*Summary of the L. acidophilus findings in the salivas from 41 Benton (Ark.) and 99 Bauxite (Ark.) pupils*

Item		Distribution of children according to the estimated number of *L. acidophilus* per cc of saliva								
		Negative	Less than 100	100 to 1,000	1,000 to 3,000	3,000 to 12,000	12,000 to 21,000	21,000 to 30,000	30,000 and over	Total
Benton pupils without mottled enamel (ages 14-21 years).	Number	7	4	7	3	3	4	3	10	41
	Percent	17.1	9.7	17.1	7.3	7.3	9.7	7.3	24.5	100.0
Bauxite pupils with mottled enamel (ages 14-22 years).	Number	13	10	0	2	10	3	0	12	50
	Percent	26	20	0	4	20	6	0	24	100.0
Bauxite transitional group—born within 1½ years of water change (ages 11-13 years).	Number	10	4	3	3	1	0	0	2	23
	Percent	43.5	17.4	13.0	13.0	4.4	0	0	8.7	100.0
Bauxite children born 1½ years or more after change in water supply (ages 8-10 years).	Number	4	2	4	3	0	1	2	10	26
	Percent	15.4	7.7	15.4	11.5	0	3.8	7.7	38.5	100.0

DESCRIPTION[10] AND MINERAL COMPOSITION OF THE BAUXITE AND BENTON COMMON WATER SUPPLIES

Bauxite.—Since May 25, 1928, the Bauxite common water supply has been obtained from the Saline River. Pumps at the river deliver the water to the purification plant through approximately 6½ miles of 6-inch, and ½ mile of 4-inch pipe. The raw water is discharged into a mixing chamber of the over- and-under baffle type and is coagulated with about 0.3 grain per gallon each of sodium aluminate and aluminum sulfate. After mixing, the water flows into a sedimentation basin; the detention period is from 7 to 8 hours. The settled water then passes through a rapid sand filter to a small clear well from which it is pumped to a covered metal tank. Filter wash water is obtained from a 50,000-gallon covered metal elevated tank. Just after the filtered water leaves the pump a dose of about 0.5 p. p. m. of chlorine is added. The treated water flows from the storage tank to the mains by gravity.

The original domestic water supply of Bauxite was obtained from shallow wells and a few springs. With the increase in population and contamination of certain of these surface supplies, a new water supply became necessary, and in 1909 two 297-foot wells were drilled. One of these wells became partly filled at the bottom from caving, and in September 1925 a new 245-foot well was added. The public water supply was obtained from these two deep wells until the use of the filtered river water began in May 1928. At the time of the 1938 survey the 245-foot well was still being used for industrial purposes; the other well had been abandoned. Water from this deep well may be pumped into the distribution system, but it would have necessitated the repair of a relift pump and manipulation of a one-gate valve. There was no record of this having been done since the installation of the filtered river water in 1928. Practically all of the population uses the common water supply.

Benton.—The Benton public water supply is obtained from the Saline River. The present plant was placed in operation in 1936 but Benton has obtained its public water supply from the Saline River for more than 20 years, a period longer than the lifetime of the group examined. A pump delivers the river water through ⅝ mile of 8-inch pipe to a one million gallon settling tank, which is divided in half so that it may be cleaned and still provide settling facilities. From the settling tank the water flows by gravity through ⅝ mile of 8-inch line to the purification plant. Lime and aluminum sulfate, each in doses of 0.15 to 0.2 grains per gallon, are added in a small mixing chamber which is equipped with a mechanical mixer. From the mixing chamber the water flows under a baffle to the sedimentation basin, the deten-

[10] The description of the water supply used at present at Bauxite and Benton was supplied by Dr. W. B. Grayson, State Health Officer, Arkansas State Board of Health.

TABLE 5.—*Analyses of the waters used at Bauxite and Benton, Ark., in parts per million*

	[1] 1928		[2] 1938		[3] 1940	
	Bauxite deep-well water	Bauxite filtered water (Saline River)	Bauxite 245-foot deep well	Bauxite filtered water (Saline River)	Bauxite filtered water (Saline River)	Benton filtered water (Saline River)
Total residue on evaporation	1003 0	86 0	958.6	60.0	74 0	78.8
Loss on ignition	43 0	14.0	27 4	10.6	11 2	16 2
Fixed residue	960 0	72 0	931.2	49 4	62 8	62.6
Silica (SiO_2)	18 6	6.0	13.6	5.8	5 0	6.0
Iron (Fe)	1.0	.3	.1	.02	0 04	0.06
Aluminum (Al)	-----	-----	.4	0	0	0
Calcium (Ca)	25.3	17.6	30 9	11.4	14 6	17.4
Magnesium (Mg)	7.0	2 1	8 8	3.7	2.9	3.1
Sodium and potassium (calculated as Na)	-----	-----	333.4	2.9	4.7	3 4
Sodium (Na)	344 6	9 6	-----	-----	-----	-----
Potassium (K)	9 2	3 4	-----	-----	-----	-----
Carbonate (CO_3)	1 2	0	0	0	0	0
Bicarbonate (HCO_3)	258 2	63.4	247 6	47 5	62 8	62 2
Sulfate (SO_4)	39.6	15 7	36.0	10 3	8 9	8 1
Nitrate (NO_3)	3	03	0	27	0 11	0 16
Chloride (Cl)	415.9	3 75	389 5	3 0	1.5	1.0
Phosphate (PO_4)	-----	-----	.1	0	0	0
Boron (B)	-----	-----	.8	0	-----	-----
Fluoride (F)	([4])	([4])	14 1	0	[5] 0	[5] 0

[1] Samples collected in July 1928 [2] Samples collected in March 1938 [3] Samples collected in May 1940

[4] These 1928 samples were recently analyzed (October 1940) for fluoride content by one of us (E E) who found that the deep well water contained 13 0 parts per million of fluorides (F), the filtered river water, 0.1 part per million.

[5] Two additional monthly samples from each locality (Bauxite and Benton), collected in June and July 1940, were also examined for fluoride The results were negative, as in the May samples. The limit of the sensitivity of the fluoride test employed may be considered as about 0 1 part per million. (Pub. Health Rep , **48**: 1219–1222 (Oct. 6, 1933)) Assistant Chemist C. G Remsburg carried out the determinations other than fluoride and boron, using mostly the methods given in the Standard Methods of Water Analysis of the American Public Health Association The phosphate was determined colorimetrically by an adaptation of the Benedict and Theis method (J. Biol Chem., **61**: 63 (1924)). The boron determinations were made essentially by the method of Foote (J. Ind Eng. Chem , Anal. Ed., **4**: 39 (Jan. 15, 1932)).

tion period being approximately 6 hours. The water from the sedimentation tank then flows through two rapid sand filters, only one filter being used at a time. The wash-water is obtained from the system and is pumped for the backwash pressure. Liquid chlorine is added as the water leaves the filters for the 100,000-gallon covered clear well. The water is pumped from the clear well to a 75,000-gallon covered metal elevated tank and the distribution system.

Mineral composition.—The mineral composition of the common water supplies, based upon samples collected in 1928, 1938, and 1940, is given in table 5.

DISCUSSION

Because of the limited number of observations possible in a small population, the findings of this study must be interpreted with considerable caution. But it does seem from the data presented that the factor responsible for the marked inhibition of dental caries in areas of endemic dental fluorosis may be operative for a considerable period after the group has ceased using the high fluoride water supply. Whether this factor functions locally, systemically, or both ways, is not known.

A first inspection of table 2 might suggest that those pupils with moderate to severe dental fluorosis are less liable to attack by dental caries than those not so affected. A comparison, for instance, of section B with section C (table 2) shows that in a group roughly comparable as regards age, the 50 Bauxite pupils with endemic dental fluorosis, but using a water for the past 12 years similar to that used by the 45 Benton high school pupils during their entire lifetime, have experienced markedly less dental caries in their first permanent molars, 42 percent and 69 percent, respectively. In the Bauxite pupils 15, or 30 percent, were free of caries in all first molars; at Benton, only 6, or 13 percent, had no dental caries.

But the mechanism associated with this limited immunity from dental caries does not seem to be wholly dependent, if at all, upon the presence or absence of macroscopic dental fluorosis. The "transitional group" at Bauxite, born within 1½ years of the change in the water supply and in whom only one case of "very mild" dental fluorosis was observed, also show an inhibition of dental caries when compared with the younger children. Similar observations by Dean and McKay in the 1938 survey, as shown in table 1, indicate that there was some factor inhibiting the development of dental caries in the deciduous molars of those children in Bauxite who were born prior to the change in the water supply. It does not seem logical to explain this observed difference on the basis of the presence or absence of macroscopic dental fluorosis, since no positive diagnosis of dental fluorosis was made on any of the deciduous teeth in this group. These observations on the deciduous teeth are in accord with the findings of Dean (*1*) on six communities with varying amounts of fluorides in the communal water supplies. The 1940 observations at Bauxite with respect to the first permanent molars are in accord with the results reported by Dean, Jay, Arnold, McClure, and Elvove (*2*) for Galesburg, Ill., where no marked difference was found in the children with dental fluorosis compared to those who were not so affected.

In respect to the bacteriological findings, attention may be called to the following points:

First, the enamel of the teeth of all of the Bauxite pupils, ages 14–22 years (section B, table 2), revealed the distinctive hypoplastic signs of dental fluorosis, with the discreet and confluent pitting symptomatic of the severest forms of mottled enamel being common.[11] The teeth of the 45 Benton students, on the other hand, were free of mottled enamel, and showed a type of calcification commonly considered normal. The percentage of high *L. acidophilus* counts (30,000 and over) in both the Bauxite group and the Benton group was approxi-

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[11] The excellent photographs taken by McKay (*14, 15*) attest the severity of the mottled enamel developed by the users of the "old" water supply.

mately the same. An examination of the number of low counts (0 and less than 100) shows 26.8 percent of the Benton group in this category in contrast with 46 percent of the Bauxite group. This difference borders on statistical significance, but the limited number of observations do not warrant any definite conclusions.

Second, the "transitional group" (those born within 1½ years of the water change) shows the lowest amount of dental caries; the youngest Bauxite group (ages 8–10 years), the highest. An analysis of the difference between the low counts recorded for these two groups indicates a statistically significant difference with a critical ratio of 2.88.

An analysis of the data presented in tables 1 and 2 might suggest that certain physiological effects, at least insofar as they relate to the inhibitory influence on dental caries, had carried over in the Bauxite population for several years after the change from the high fluoride water to the fluoride-free water. This seemingly would apply to both the older group with mottled enamel and to the "transitional group" as well. The possibility of physiological effects being carried over in a population several years after cessation [12] of exposure to waters of high fluoride content obviously requires much additional study.

Another question that naturally arises is whether or not the enamel of certain teeth, despite the absence of macroscopic dental fluorosis, contains more fluorine than the enamel of similar teeth calcified in a community whose public water supply for a number of years has been free of fluorides. Specifically, these are the deciduous teeth (table 1) calcified under the conditions existing in Bauxite prior to or shortly after the change in the water supply and the permanent teeth of the "transitional group" (table 2). With respect to Bauxite, of course, much of this study material is no longer available for biochemical analyses, but continuing studies of selected communities from the time that the water supply is changed may shed some light on this particular aspect of the question.

[12] From the standpoint of descriptive epidemiology it seems relevant to note that there is no evidence that the population was actually using a fluoride-free water immediately after the introduction of the filtered river water in 1928. This water, although fluoride-free when analyzed in 1938 and 1940, may possibly have contained very small amounts of fluoride during the first few years of its use because of incrustations in the iron pipes of the distribution system, cooking utensils, etc. As noted in the footnote to table 5, a recent analysis of the sample of the 1928 "filtered river water" received at this laboratory in July 1928, showed a fluoride (F) content of 0.1 part per million. It is not possible, however, to learn whether this sample was taken from a tap on the distribution system or from the treatment plant installed a few months before the collection of the sample. A personal communication, however, from Mr. L. R. Branting, superintendent of the Republic Mining & Manufacturing Co., dated October 25, 1940, states that after checking with the laboratory personnel, it seemed to be the consensus that the 1928 sample of filtered river water was taken from a tap in the laboratory. He notes that the community had been using the filtered river water for several months at the time that the sample was collected and that there would have been no particular reason in going to the filter plant when it was possible to collect the sample at the company's chemical laboratory at the administration building. The influence, if any, of this variable cannot, of course, be precisely assessed on the present evidence; the best possible information now available, however, suggests that the 1928 filtered river water sample was collected from a tap on the distribution system.

In an attempt to interpret these observed effects, particularly as regards the "transitional group," the possibility of a placental or mammary transfer, or both, of the factor or factors associated with the dental caries inhibition, must be given careful consideration. In this connection it might be remarked that the transfer of fluorine by placental or mammary means has been presumed on the basis of epidemiological evidence (*4*, *19*, *20*, *21*, *22*) and demonstrated experimentally (*23*, *24*, *25*), although other workers (*26*, *27*) have been unable to demonstrate the mammary transfer of fluoride in cow's milk.

It is apparent that much additional study of this phenomenon is needed to elucidate the manner in which this limited immunity from dental caries operates. The partial inhibition of dental caries, moreover, may be only a part of a larger problem in general physiology relative to the continued ingestion of varying amounts of fluorides by general population groups.

Two findings of this study seem worthy of stressing:

1. The older Bauxite group, all of whom showed a moderate to severe type of endemic dental fluorosis, disclosed markedly less dental caries than a comparable group at Benton who were free of mottled enamel.

2. The cumulative increase in the amount of dental caries experience concomitant with increasing years of exposure to risk did not hold true in the Bauxite school population studied. The reversal in trend of this epidemiological constant suggests the noticeable physiological influence which operated in this population and which was presumably associated with the change in the communal water supply.

SUMMARY

1. Bauxite pupils with moderate to severe mottled enamel and exposed to fluoride-free waters during the past 12 years showed markedly less dental caries than a comparable group of Benton pupils without mottled enamel who had been using a fluoride-free water during their lifetime.

2. This limited immunity from dental caries is seemingly not dependent upon the presence of macroscopic mottled enamel because children born within several years of the change in the water supply and practically free of mottled enamel likewise disclosed a low dental caries experience.

3. The youngest age group at Bauxite—those farthest removed in time from the influence of the "old" high fluoride water—shows the highest dental caries experience in spite of the fact that they had been exposed to risk of caries for the shortest period of time.

4. The *L. acidophilus* counts apparently reflect a difference in caries activity in the several groups studied, a result which is seemingly consistent with the clinical findings in these groups.

5. Teeth moderately to severely affected with mottled enamel showed no tendency to rampant dental caries even though they had been exposed to a fluorine-free water for the past 12 years.

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A FURTHER STUDY OF THE RORSCHACH TEST APPLIED TO DELINQUENTS

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This is the third and final article dealing with the relationship of various factors to the Rorschach test as applied to a group of 476 prisoners admitted to the United States Northeastern Penitentiary during the fiscal year 1935–36. The first article dealt with the age factor (*1*). The second was concerned with marital status (*2*). The current study takes up the remaining ten factors analyzed, namely, offense, education, occupation, national descent, continuity of the home, body build, educational grade status, mental age, Woodworth personal data scores, and psychiatric diagnosis. Interrelationships among various intrinsic test factors such as reaction time and total scores are also reported.

A detailed description of the experimental group, together with a discussion of the procedure used in giving the test and in scoring it, will be found in a preceding article (*1*). Suffice it to say the subjects were quite representative of the institutional population as a whole. Neither do they differ markedly from the 11,170 male admissions to Federal penal and correctional institutions for the corresponding fiscal year as to age, marital status, education, and race (*3*). There is some

divergence for offense, counterfeiters making up 23.7 percent of the experimental group in contrast to 9.2 percent for all Federal prisoners, and Internal Revenue Act and liquor law violators making up only 22.9 percent in contrast to 46.1 percent for all Federal prisoners. Comparable data for occupation, continuity of the home, body build, educational grade status, mental age, responses to the Woodworth personal data sheet, and psychiatric diagnosis were not available for all the Federal offenders. In all probability if such data could be obtained a close similarity would be noted, close enough to warrant the assumption that the present findings in regard to the Rorschach test might also apply to any group selected from among all male admissions to Federal prisons and reformatories.

The relationships among various factors were studied by the use of three statistical techniques. If both variables were of the continuous type, the familiar Pearson's product-moment coefficient of correlation was determined. If one variable was continuous and the other distributed in more than two categories, or if both occurred in two or more categories, the coefficient of contingency was computed as outlined by Guilford (*4*). Finally, if one variable was continuous and the other could be forced into two categories, the biserial coefficient of correlation was determined as described by Dunlap (*5*).

EXTRINSIC FACTORS

Although no one has yet succeeded in defining what is meant by personality, it is apparently the resultant of numerous functions and subject to numerous influences. In the present instance offense is a factor of considerable importance. All criminals are not alike. The suave fake oil stock promoter is far different from the hillbilly moonshiner. There seems to be a definite tendency for certain types of individuals to drift toward a particular type of crime. Offense should, therefore, bear some relationship to the personality of antisocial individuals.

While it may be true that heredity determines the predisposition toward the development of a certain type of personality, it cannot be denied that what we are born with is subject to modification under the molding influence of education. Therefore, education is a factor worth investigating in its relationship to personality.

Occupation is another factor to be investigated in its relationship to personality. Individuals tend to pick out lines of endeavor suitable to their personalities. A quiet, taciturn man is not likely to choose salesmanship as a career; conversely, a sociable, talkative individual is not apt to apply for a job as lighthouse keeper.

Nationality is also a factor that should be considered in a study of personality. National differences do exist. The phlegmatic Swede

can hardly be mistaken for a volatile southern European, nor the stolid Slav for an aggressive Prussian.

The importance of the continuity of the home in the development of personality has been stressed by many authors. It seems logical to assume that a child from a home broken by the death, separation, or divorce of the parents feels insecure and by virtue of that insecurity may acquire abnormal traits of personality. Therefore, the continuity of the home is a factor worth consideration in a study of personality.

The relationship of body type to personality has received considerable attention by numerous investigators. Kretchmer popularized the concept that the introverted individual is generally the tall, thin, asthenic type and the extroverted individual is generally the short, broad, pyknic type. The body build factor is therefore justifiably included in any personality study.

Educational grade status, mental age, and score on the Woodworth personal data sheet purport to be objective measures of educational achievement, intellectual capacity, and certain abnormal mental traits, respectively, all of which are aspects of personality. The three objective measures may, consequently, be added to the list of factors related to personality.

Since psychiatric diagnosis is essentially a classification of personalities emphasizing certain abnormal categories it, too, may be added to the list of factors related to personality.

If all these factors are related to personality, it stands to reason that any test which claims to be an objective measure of personality should show some degree of relationship to one or more of these factors. The Rorschach method is described as an objective approach to a study of personality and, therefore, should correlate with some of the factors selected.

Intercorrelations among extrinsic factors.—The various extrinsic factors may be related to one another, thereby showing a common relationship to the Rorschach test. Intercorrelations among these various factors are shown in table 1.

A significant relationship occurs in the following instances based on the assumption that a coefficient of correlation is significant if it exceeds four times the probable error: (1) Age versus marital status, offense, occupation, national descent, body build, and psychiatric diagnosis; (2) marital status versus offense, occupation, national descent, body build, Woodworth personal data responses, and psychiatric diagnosis; (3) offense versus education, occupation, national descent, body build, educational grade status, mental age, Woodworth personal data responses, and psychiatric diagnosis; (4) education versus occupation, national descent, body build, educa-

tional grade status, mental age, and psychiatric diagnosis; (5) occupation versus national descent, body build, educational grade status, mental age, and psychiatric diagnosis; (6) national descent versus body build, educational grade status, mental age, Woodworth personal data responses, and psychiatric diagnosis; (7) body build versus educational grade status, mental age, Woodworth personal data responses, and psychiatric diagnosis; (8) educational grade status versus psychiatric diagnosis; (9) Woodworth personal data responses versus psychiatric diagnosis.

TABLE 1.—*Correlations* [1] *among extrinsic factors studied in relationship to Rorschach test scores*

Factor	Marital status	Offense	Education	Occupation	National descent	Continuity of home	Body build	Educational grade status	Mental age	Woodworth personal data	Psychiatric diagnosis
Age	0 45	0 43	*-0.01	0.25	0 32	**-0 06	0 30	*-0 02	*-0.02	*0 00	0 33
Marital status	-----	.30	.11	.20	.26	04	.41	.12	.09	18	.32
Offense	-----	-----	.30	.29	.35	10	.24	26	.28	.21	.34
Education	-----	-----	-------	.38	.26	** 04	.15	*.35	* 32	*-01	.43
Occupation	-----	-----	-------	-----	.40	.07	.14	.42	.36	.12	.32
National descent	-----	-----	-------	-----	-----	.07	.24	.43	41	23	.43
Continuity of home	-----	-----	-------	-----	-----	------	.05	** 10	** 14	** 09	.09
Body build	-----	-----	-------	-----	-----	-------	------	.15	.17	17	.25
Educational grade status	-----	-----	-------	-----	-----	-------	------	------	* 86	* 00	49
Mental age	-----	-----	-------	-----	-----	-------	------	------	--------	*.00	62
Woodworth personal data	-----	-----	-------	-----	-----	-------	------	------	--------	------	.39

[1] The coefficients of correlation include the conventional Pearson's r, indicated by single asterisks, the biserial r indicated by double asterisks, and the coefficient of contingency indicated by the figures without asterisks. Probable errors range from 0 02 to 0.04.

A highly significant correlation (0.60 or higher) occurs only in two instances, educational grade status versus mental age, and mental age versus psychiatric diagnosis. In other words, the Stanford achievement test is essentially another intelligence test or else the Army intelligence tests in reality measure educational achievement. Psychiatric diagnosis, as far as prisoners are concerned, still leans heavily upon intellectual status.

Intercorrelations between extrinsic and intrinsic factors.—Correlations between extrinsic factors and reaction times appear in table 2.

There are no highly significant correlations between reaction times and the various extrinsic factors. However, certain directional tendencies do exist. Postal-law violators, skilled laborers, individuals of German descent, individuals of athletic body build, the well educated, and the intelligent tend to give the speediest responses. On the other hand, liquor law violators, common laborers, colored persons, individuals of pyknic body type, and the feeble-minded tend to give the slowest responses.

TABLE 2.—*Intercorrelations*[1] *between extrinsic factors and reaction times to Rorschach test cards*

Reaction time to card No.—	Offense	Education	Occupation	National descent	Continuity of home	Body build	Educational grade status	Mental age	Woodworth personal data	Psychiatric diagnosis
	C	r	C	C	rbi	C	r	r	r	C
1	0.17	−0 02	0 10	0.27	0 01	0 11	−0 03	−0.08	0.01	0.17
2	.16	−.02	.14	.16	.02	.15	−.05	−.01	.00	.12
3	.13	−.01	.14	.26	.01	.12	−.03	.00	.01	.12
4	.23	−.02	.14	.24	.20	.14	− 01	−.01	.00	.16
5	.22	−.01	.16	.20	.02	.10	−.01	.04	−.01	.24
6	.20	−.02	.12	.13	−.02	.10	−.06	−.05	.00	.11
7	.14	−.02	.20	.17	− 03	.10	−.07	−.09	−.01	.12
8	.15	−.02	.12	.19	−.03	.14	−.02	.01	−.01	.17
9	.22	−.02	.17	.13	−.09	.11	−.05	−.10	− 01	.09
10	.19	−.01	.17	.16	.13	.10	−.01	.02	.00	.14

[1] The conventional coefficient of correlation (Pearson's) is indicated by the symbol *r*, the biserial coefficient by *rbi*, and the coefficient of contingency by *C*. Probable errors range from 0.02 to 0.05.

The correlations between extrinsic factors and various total scores obtained on the Rorschach test are presented in table 3.

TABLE 3.—*Correlations*[1] *between various extrinsic factors and total Rorschach test scores*

Total scores	Offense	Education	Occupation	National descent	Continuity of home	Body build	Educational grade status	Mental age	Woodworth personal data sheet	Psychiatric diagnosis
	C	r	C	C	rbi	C	r	r	r	C
Total responses	0.21	0 18	0 24	0 16	−0.03	0 14	0.21	0.35	0 01	0.23
Popular, unweighted	.15	.09	.20	.20	.01	.16	.11	.16	−.01	.23
Popular, weighted	.21	−.07	.20	25	−.04	.17	.09	.02	−.01	.24
Original	.17	.13	.26	.18	−.04	.13	.20	.21	.02	.26
Whole	.24	.14	19	.21	− 05	.14	.17	19	.01	.19
Detail	.17	.44	25	.23	− 17	.13	.63	.57	.01	.22
Unusual detail	.14	.05	02	.15	.02	.11	.40	.22	.03	.10
Form	.23	.16	24	.16	−.08	.17	.24	.28	.01	.24
Motion	.12	.05	.10	.08	.04	.09	.24	.59	01	.09
Color	.09	.04	.17	.07	.02	.06	25	.54	.01	.02
Animal	.25	.16	.18	.18	− 08	.16	.16	.16	−.01	.19
Animal anatomy	.20	.12	.17	.22	−.04	.09	.20	.33	−.01	.22
Human	.15	−.02	.13	.10	.10	.10	.46	.41	.02	.18
Human anatomy	.19	.09	.23	.13	− 09	.11	.25	.32	.01	.20
Inanimate objects	.18	.04	.18	.15	.10	.09	.16	.26	.02	.15
Abstract	.11	.06	.07	.09	.01	.08	.21	.46	.01	.13
Analysis of cards:										
General to detail	.11	.08	.15	.16	.07	.11	.27	.54	− 01	.19
Detail to general	.07	.03	.05	.14	.01	.03	.21	.57	.01	.13
General only	.18	.03	.11	.16	−.13	.12	−.03	−.11	.01	.17
Detail only	.17	.06	.17	.11	−.08	.11	.07	−.11	.01	.11

[1] The conventional Pearson's coefficient of correlation is indicated by the symbol *r*, the biserial coefficient by *rbi*, and the coefficient of contingency by *C*. Probable errors range from 0.02 to 0 04.

Offense shows some relationship to all total scores except motion, color, analysis of cards by the general to detail and detail to general methods. There are no highly significant correlations, but there are certain directional tendencies. Postal-law violators tend to have the highest scores in all categories except for unusual detail, color, human, human anatomy, and abstract responses. They also show a greater

tendency to analyze cards by the general to detail and detail to general methods. Violators of the Dyer Act show the highest scores for unusual detail, color, and human anatomy responses; while counterfeiters exceed the others in the total number of human responses and the number of cards analyzed by the detail method only.

Education correlates to a moderate extent with total, original, whole, detail, form, and animal responses, the highest correlation being with detail replies. The tendency is for educated individuals to give a higher number of responses in all categories except for popular weighted and human. No highly significant correlations were found.

Occupation bears a modest but not a highly significant relationship to all total scores except unusual detail, motion, abstract, and analysis of cards by the detail to general and general only methods. The professional and clerical groups tend to give the highest number of responses in all categories except for popular weighted and unusual detail. They also show a preference for analysis of cards by the general to detail and detail to general methods. On the other hand, common laborers show the lowest total scores in all categories except for popular weighted and unusual responses in which they excel all other occupational types.

National descent correlates to a certain, but not highly significant, degree with all total scores except motion, color, human, abstract, and analysis of cards by the detail method only. Persons of English descent tend to show the highest popular weighted score; those of Scandinavian descent seem to prefer analysis of cards by the detail to general methods; those of German extraction obtain the highest scores for general to detail analysis of cards, animal anatomy, human, abstract, and unusual detail responses; and those of Jewish parentage have the highest scores in all other categories of responses.

Germans show the lowest total scores for analysis of cards by the detail to general method, detail only method of analysis, total number of detail responses, and animal responses. This is rather surprising. One would expect the Germans to be methodical and therefore attentive to details. The Italians obtain the lowest scores for color and motion responses. This is another odd finding. Color and motion are supposed to measure emotion. One would expect more lability of the emotions in southern Europeans and hence higher color and motion responses. Negroes show the lowest total scores in all other categories.

A history of a home disrupted by death, separation, or divorce of parents does not correlate positively with any of the total scores to any significant degree. There is a slightly significant negative relationship with total detail responses and analysis of cards by the general method only. The directional tendency is for lower total scores in all instances except for popular unweighted, unusual detail,

motion, color, human, inanimate object, abstract, and analysis of cards by the general to detail and detail to general methods.

Body build bears a mild relationship to all total scores except motion, color, animal anatomy, human, human anatomy, inanimate objects, abstract, and analysis of cards by any of the four methods. No highly significant correlations occur. In general, individuals of athletic body type obtain the highest scores in all instances except for popular weighted responses, whole, form, and analysis of cards by the detail method only. Persons of pyknic body type tend to give the highest number of popular weighted responses while those of asthenic body type give the highest number of whole and form responses.

Educational grade status shows some degree of positive relationship to all total scores except popular responses, both weighted and unweighted, and analysis of cards by the general or detail methods only. There is a high correlation between educational grade status and detail responses and a relatively high correlation between educational grade status and human responses.

Intelligence shows some degree of positive relationship to all total scores except popular weighted and analysis of cards by the general and detail methods only. In fact, for the latter there is almost a significant negative relationship. In general, intelligence shows a higher degree of correlation with the various total scores than any other extrinsic factor studied. This is particularly noticeable for detail, motion, color, and analysis of cards by the general to detail and detail to general methods.

The Woodworth personal data scores do not correlate with any of the intrinsic Rorschach test factors. This is a disappointing finding. Theoretically, the two techniques should have something in common since both purport to measure personality traits.

Psychiatric diagnosis reveals no highly significant correlation, but shows some relationship to all total scores except unusual detail, motion, color, and analysis of cards by the detail to general and detail only methods. Individuals diagnosed as simple adult maladjustment tend to have the highest scores for popular unweighted, color, animal anatomy, motion, total, and analysis of cards by the detail to general and general to detail methods of analysis. Psychopathic personalities tend to have the highest popular weighted score. Neurotics have the highest scores in all other categories. Simple adult maladjustment is associated with the lowest popular weighted score. Mental deficiency shows the lowest scores for analysis of cards by all methods except detail only, whole, color, animal anatomy, human anatomy, unusual detail, and total responses. Psychopathic personalities show the lowest scores in all the rest of the categories.

As Hertz (*6*) points out in her historical summary, validation of the Rorschach test has been to a great extent in terms of comparisons

between Rorschach diagnoses and case studies or general qualitative impressions rather than in terms of statistical techniques. The relationship of intelligence to Rorschach test factors has received considerable attention with equivocal results. Likewise, the few studies of nonintellectual factors using correlational methods have not been very profitable. Therefore, as far as the relationship of extrinsic factors to the Rorschach test is concerned, the present findings are in concurrence with those of the majority of statistical investigations reported in the literature.

INTRINSIC FACTORS

Reaction times and primary responses according to formula are shown in table 4.

TABLE 4.—*Reaction times and percentage distribution of primary responses to the Rorschach test cards according to formula*

	Card No.									
	1	2	3	4	5	6	7	8	9	10
	Reaction time in seconds									
Range	1-43	2-65	2-62	2-52	1-57	1-47	2-80	2-40	2-86	1-70
Quartile 1	5.7	7.9	8.0	7.4	5.5	8.7	11.7	7.4	12.9	7.3
Quartile 2	8.2	11.8	11.7	10.8	8.4	15.6	18.2	10.3	18.6	10.2
Quartile 3	11.8	19.6	18.9	16.3	12.6	31.6	33.7	13.8	33.6	14.4
Mean	9.9	14.9	14.6	12.2	10.4	18.6	21.2	11.3	21.5	12.8
	Primary response (percent)									
Whole, form, animal	75.2	38.4	-----	11.6	79.2	14.9	-----	-----	-----	-----
Whole, form, animal anatomy	-----	-----	-----	58.6	-----	31.9	-----	-----	-----	-----
Whole, form, human	-----	-----	39.1	-----	-----	-----	-----	-----	-----	-----
Whole, form, inanimate object	-----	-----	-----	-----	-----	-----	22.4		-----	-----
Detail, form, animal	-----	17.2	-----	-----	-----	-----	-----	74.6	-----	62.4
Detail, form, human anatomy	-----	-----	10.5	-----	-----	-----	-----	-----	12.0	-----
Nothing	-----	23.5	22.7	18.1	-----	44.9	55.5	-----	55.5	16.4
All other	21.8	20.9	27.7	11.7	20.8	8.3	22.1	25.4	32.5	21.2

In summarizing the findings a typical representative of the experimental group, based on averages and highest frequencies, would give the following primary responses and have the following reaction times: Card No. 1, bat, 9.9 seconds; card No. 2, nothing 14.9 seconds; card No. 3, two men, 14.6 seconds; card No. 4, hide, 12.2 seconds; card No. 5, butterfly, 10.4 seconds; card No. 6, nothing, 18.6 seconds; card No. 7, nothing, 21.2 seconds; card No. 8, two animals, 11.3 seconds; card No. 9, nothing, 21.5 seconds; and card No. 10, crabs, 12.8 seconds.

Total scores obtained by the experimental group are shown in table 5.

TABLE 5.—*Total scores on Rorschach test*

Total Rorschach test scores	Quartile 1	Quartile 2	Quartile 3	Highest score	Mean
Responses (total)	11.5	12.9	15.6	49	13.9
Popular (unweighted)	10.3	11.5	13.2	27	11.3
Popular (weighted)	505.6	672.5	819.8	1,173	627.5
Original	.6	1.6	3.8	30	2.5
Nothing (no response)	1.5	2.8	4.3	10	2.6
Whole	4.4	6.2	7.9	18	5.9
Detail	3.2	4.9	7.2	34	5.3
Unusual detail (small, white space, etc.)	.3	.5	.8	2	.1
Form	8.1	10.7	14.2	49	11.2
Motion	.3	.6	9	5	.2
Color	3	.5	8	6	.1
Animal	4.8	6.5	8.3	18	6.3
Animal anatomy	1.1	1.9	3.1	16	1.8
Human	.5	1.2	1.6	6	.7
Human anatomy	.4	9	2.5	15	1.1
Inanimate objects, landscapes, etc	.6	1.2	2.3	14	1.3
Abstract	.3	.5	.8	8	.2
Analysis of cards:					
General to detail	.3	.6	.9	7	.3
Detail to general	.3	.6	.9	3	.2
General only	3.6	4.9	6.0	10	4.3
Detail only	2.3	3.0	3.9	9	2.7

The total scores of a typical representative would be as follows, leaving out decimal places: Responses, 14; popular (or vulgar), 11; original, 3; whole, 6; detail, 5; form, 11; animal, 6; animal anatomy, 2; human, 1; human anatomy, 1; inanimate objects, 1; and unusual detail, motion, color, or abstraction, 1. He would analyze 4 cards by seeing the pictures as a whole, 3 cards by seeing details only, and one card by seeing the picture first as a whole only, and then proceeding to details or vice versa. In two cards he would say that he saw nothing at all; in two others he would say that he saw nothing, but would later spontaneously change his mind. If he showed any "color shock" at all, it would be to card No. 2, where a splotch of red is added, rather than to card No. 8, the first in the series which is entirely colored.

Harriman (7), in a study of 100 college students, compares his findings with those of Rorschach for normal individuals and those of Beck for feeble-minded children. These comparisons are shown in table 6 together with the corresponding norms for the present experimental group.

TABLE 6.—*Comparison of Rorschach test scores*

Scores	Rorschach's normal group	Harriman's college group	Beck's feeble-minded group	Author's delinquent group
Mean total responses	15.0–30.0	52.0	21.6	13.9
Mean whole	8.0	11.1	----------	5.9
Mean detail	23.0	33.0	----------	5.3
Mean rare and white space detail	3.0	3.7	----------	.1
Mean motion	----------	4.3	.8	.2
Mean color	1.5–3.5	2.7	2.4–3.8	.1
Mean anatomy (animal and human)	----------	3.5	----------	2.9
Percentage animal	60.0	39.3	55.4	45.2
Percentage good form	70.0–80.0	78.0	57.8	71.3
Percentage original	----------	25.0	35.8	18.0

At this point there is a great temptation to become speculative. Why is there such an obvious difference between delinquents and nondelinquents and what does it signify? The unproductiveness of the former is certainly not due to feeblemindedness. Therefore, there must be some other explanation. Perhaps antisocial individuals are lacking in imagination. They do not care about the less tangible things of life. What they want is something readily perceived by the senses, such as material wealth and possessions. The Rorschach test reveals this lack of imagery in poor productivity. The high percentage of good form interpretations also tends to confirm the emphasis upon concreteness.

The tendency toward taking a bird's-eye view of a given situation and paying little attention to detail is reflected in the preponderance of whole over detail responses. The average prisoner does not display logical thinking, that is, proceeding from detail to general observations or vice versa. He prefers to jump at conclusions by seeing situations as a whole or else seizes upon details without coming to any general conclusions. Obviously, if he were a logical thinker he would stop to weigh the gain against the consequences of antisocial behavior instead of being blinded by the prospect of immediate profit.

The practical absence of color and motion responses indicates that the average delinquent has an arrested emotional development. This may account for the indifference of antisocial individuals to ethical standards set up by society. Incidentally, the tendency toward emotional indifference was noted in a study of male prisoners by the Neymann-Kohlstedt test (*8*). Their scores reached a peak in the middle zone of the curve of distribution instead of showing the normal bimodal disposition of scores into extratensive and intratensive characteristics. In other words, delinquents are neither extroverts nor introverts.

One might speculate further, but a much simpler explanation for the paucity of responses can be advanced. In the first place, the rigid standardization of the test procedure undoubtedly cut down on the number of responses. In the second place, prisoners are naturally inhibited by suspicion of anyone who is on the other side of the fence. This barrier between prisoners and personnel is difficult to break down. Therefore, despite assurances to the contrary, many of the present subjects probably failed to cooperate because of the fear that the examiner was trying "to get something on them." The scarcity of motion and color responses may be accounted for to a certain extent by the simplification of scoring.

Intercorrelations among the various reaction times are shown in table 7. As may be readily perceived, there is no correlation among the ten Rorschach test cards as far as reaction time is concerned. In

all instances four times the probable error exceeds the coefficient of correlation.

TABLE 7.—*Intercorrelations*[1] *among reaction times to the Rorschach test*

Card No.	2	3	4	5	6	7	8	9	10
1	0 08	0 05	0 05	0.00	0.07	0 06	0 00	0.07	0 03
2	-------	.09	.12	.08	.08	.04	06	.05	.08
3	-------	-------	.08	.06	.05	.03	.05	.02	.05
4	-------	-------	-------	.06	.08	.04	.04	.05	.05
5	------	-------	-------	-------	.05	.07	.02	.08	.02
6	-------	-------	-------	-------	-------	.02	06	.02	.05
7	-------	-------	-------	------	-------	-------	.06	.00	.04
8	-------	-------	-------	-------	-------	-------	-------	.07	.04
9	-------	-------	-------	-------	-------	-------	-------	-------	.04

[1] The coefficients are all the conventional Pearson's *r*. Probable errors are uniformly 0.03.

Intercorrelations among the various total scores are presented in table 8.

For purposes of discussion the intercorrelations among the various total scores may be divided into three groups: (1) Those in which the coefficient of correlation is less than four times its probable error, indicative of no significant relationship; (2) those in which the coefficient of correlation exceeds four times its probable error, but is less than 0.60, indicative of a significant relationship; and (3) those in which the coefficient of correlation is 0.60, or higher, indicative of a highly significant relationship.

Based on the above classification the following factors show a significant correlation: (1) Total responses versus popular unweighted, whole, unusual detail, motion, color, animal anatomy, human, human anatomy, inanimate objects, abstract, analysis of cards by the detail to general and detail only methods; (2) popular unweighted versus popular weighted, whole, detail, form, animal anatomy, human, human anatomy, and analysis of cards by the detail to general and general only methods; (3) original versus whole, unusual detail, motion, color, animal, animal anatomy, human, human anatomy, inanimate objects, abstract, analysis of cards by the detail to general and detail only methods; (4) whole versus detail, unusual detail, motion, color, animal, animal anatomy, human, human anatomy, inanimate objects, abstract, analysis of cards by the general to detail and detail to general methods; (5) detail versus motion, animal anatomy, human, human anatomy, inanimate objects, analysis of cards by the general to detail and detail to general methods; (6) unusual detail versus form, color, animal, animal anatomy, human, human anatomy, inanimate objects, abstract, and analysis of cards by the general to detail, detail to general and detail only methods; (7) form versus motion, animal anatomy, human, human anatomy, inanimate objects, abstract, and analysis of cards by all four methods; (8) motion versus animal anatomy, human, human anatomy, inani-

Table 8.—*Intercorrelations*[1] *among total Rorschach test scores*

Factor	Popular, unweighted	Popular, weighted	Original	Whole	Detail	Unusual detail	Form	Motion	Color	Animal	Animal anatomy	Human	Human anatomy	Inanimate objects	Abstract	Analysis of cards, general to detail	Analysis of cards, detail to general	Analysis of cards, general only	Analysis of cards, detail only
Total responses	0 50	−0.32	0.72	0 57	0.84	0 31	0 80	0 35	0 16	0 61	0 52	0.33	0.48	0.52	0.21	0 60	0 36	0.03	0.30
Popular, unweighted		.38	−.11	.34	.51	− 05	.51	.03	−.09	61	.38	.18	.18	.11	−.18	.03	.18	.13	.08
Popular, weighted			−.63	− 26	− 30	− 24	− 35	− 27	− 15	− 05	− 18	− 13	−.38	−.35	−.31	−.32	−.19	−.01	−.28
Original				.49	.66	.33	.65	.38	.22	38	.41	.30	.47	.59	.35	.61	.33	−.07	.30
Whole					29	.13	76	31	.15	49	.40	38	30	.51	.17	.42	.21	.64	−.05
Detail						.01	92	.14	− 06	.68	54	.25	.47	.36	.02	.41	.17	−.11	.66
Unusual detail							.28	.05	.13	.13	.14	.14	.18	.25	22	.27	.22	− 18	.16
Form								.29	.11	.72	56	.39	.48	.51	.14	.22	.32	.35	.45
Motion									.01	.04	.17	.38	.16	.27	.10	.30	.01	.11	.01
Color										.00	.05	.01	.05	.25	.37	.15	.05	.07	− 07
Animal											29	.24	.11	.18	03	.35	21	.23	.34
Animal anatomy												.17	.21	.20	06	.37	.62	.18	.22
Human													.11	.12	.09	.29	.09	.24	.04
Human anatomy														.19	.05	.34	.12	.12	.47
Inanimate objects															.16	.51	.32	.13	.01
Abstract																.26	.11	.06	.09
Analysis of cards:																			
General to detail																	.17	.44	.01
Detail to general																		−.14	−.02
General only																			−.22

[1] Coefficients are all the conventional Pearson's r. Probable errors range from 0 01 to 0 03.

mate objects, and analysis of cards by the general to detail method; (9) color versus inanimate objects, abstract, and analysis of cards by the general to detail method; (10) animal versus animal anatomy, human, inanimate objects, and analysis of cards by all four methods; (11) animal anatomy versus human, human anatomy, inanimate objects, and analysis of cards by the general to detail, general only, and detail methods only; (12) human versus analysis of cards by the general to detail and general only methods; (13) human anatomy versus inanimate objects and analysis of cards by the general to detail and detail only methods; (14) inanimate objects versus abstract, and analysis of cards by all methods except detail only; (15) abstract versus general to detail method of analysis; (16) general to detail method of analysis versus detail to general and general only methods of analysis.

A significant negative relationship exists among the following factors: (1) Total responses versus popular weighted; (2) popular unweighted versus abstract; (3) popular weighted versus whole, detail, unusual detail, form, motion, color, animal anatomy, human, human anatomy, inanimate objects, abstract, and analysis of cards by all methods except general only; (4) unusual detail versus analysis of cards by the general method only; (5) detail to general analysis of cards versus general analysis only; (6) general analysis of cards only versus detail analysis only. The negative correlation of weighted popular responses with other total scores is due largely to the high proportion of "nothing" responses which, of course, could not be classified according to the various categories.

Highly significant positive correlations were obtained for the following factors: (1) Total responses versus original, detail, form, animal, and analysis of cards by the general to detail method; (2) popular unweighted versus animal; (3) original versus detail, form, and general to detail method of analysis; (4) whole versus form and analysis of cards by the general method only; (5) detail versus form, animal, and analysis of cards by the detail method only; (6) form versus animal; (7) animal anatomy versus detail to general method of analysis. The only highly significant negative correlation occurs between popular weighted responses and original.

These intercorrelations do not agree entirely with those of Hertz (*9*) who made a similar study of Rorschach test factors using 300 students as her subjects. She reports that the whole answer factor shows the highest correspondence with movement, color score, and percentage of good original answers; that the movement factor is best related to good original, items (total responses), and whole answers; that the color score is positively related to percentage of good original and whole, but negatively related to percentage of animal responses; that the factor of animal responses shows a negative

relationship to all other factors, especially with percentage of original, color, and whole answers; and finally that the items (total responses) factor is best related to movement and originality. The present findings confirm the relatively higher degree of relationship of original and total responses to the movement factor, and of color and total responses to originality.

There is no very satisfactory method of determ ning the reliability of the Rorschach test from a statistical standpoint. Administering a parallel series of ink-blots or repeating the test has certain disadvantages. The test cards differ from each other to such an extent that the split-half method of testing for reliability is open to question. Rorschach did not intend each card to measure exactly the same factors. However, as Hertz points out, the split-half method is about the only technique that is available. Using this method she found the test to be a reliable instrument with her group of junior high school students (*9*). She points out that her findings disagree with those of Vernon, who worked chiefly with college students.

The current investigation tends to confirm Vernon's opinion that the Rorschach test is unreliable, as may be seen by reference to table 9. Hertz, quoting Vernon, states that the coefficients of correlation between the two halves of the test should be at least 0.70–0.80 for the chief categories of response if the test has any claim to objective validity. In that case the only factors that the Rorschach test measures consistently, according to the present findings, are originality, total responses, and form.

TABLE 9.—*Correlations [1] between total scores for the first 5 cards and the total scores for the last 5 cards of the Rorschach test*

Scores	Coefficient of correlation	Scores	Coefficient of correlation
Total responses	0.66	Animal anatomy	0.38
Popular, unweighted	.34	Human	.13
Popular, weighted	.31	Human anatomy	.33
Original	.74	Inanimate objects	.48
Whole	.38	Abstract	.50
Detail	.50	Analysis	
Unusual detail	.27	General to detail	.26
Form	.66	Detail to general	.32
Motion	.30	General only	.15
Color	.45	Detail only	.12
Animal	.38		

[1] Coefficients of correlation are the conventional Pearson's r. Probable errors range from .01 to .03.

SUMMARY AND CONCLUSIONS

1. The use of the Rorschach ink-blot test in a study of Federal delinquents at the United States Northeastern Penitentiary is reported.

2. The test was applied under rigidly standardized situations and scoring was made as objective as possible.

3. Under these conditions the test was found to be statistically unreliable except in measuring original, total, and form responses.

4. A high degree of positive correlation (0.60 or higher) occurred between the following total scores: (1) Total responses versus original, detail, form, animal, and analysis of cards by the general to detail method; (2) popular unweighted versus animal; (3) original versus detail, form, and general to detail method of analysis; (4) whole versus form and analysis of cards by the general method only; (5) detail versus form, animal, and analysis of cards by the detail method only; (6) form versus animal; (7) animal anatomy versus detail to general method of analysis. The only highly significant negative correlation occurs between popular weighted responses and original.

5. Correlations among sundry extrinsic factors and various intrinsic test factors revealed only six coefficients above 0.50, namely, educational grade status versus total detail responses; mental age versus total detail, color, and motion responses; and mental age versus analysis of cards by the general to detail and detail to general methods.

6. Applied as a measuring instrument, comparable to psychometric techniques, the Rorschach test is unsatisfactory in the routine examination of delinquents.

7. The Rorschach test is therefore not a test, but as Dr. Wells puts it, "an art, in which ink-blots are instruments in the same sense as the sculptor's chisel or the artist's pen."

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ORNITHODOROS VIGUERASI, A NEW SPECIES OF TICK FROM BATS IN CUBA (ACARINA: IXODOIDEA)[1]

By R. A. Cooley, *Entomologist*, and Glen M. Kohls, *Assistant Entomologist, United States Public Health Service*

Larval, nymphal, and adult specimens of a very interesting new bat tick have been received from Cuba. It is named *Ornithodoros viguerasi* in honor of the collector, Dr. I. Pérez Vigueras, University of Habana, Habana, Cuba.

ADULT

Body.—Oval, broadest at about the middle, narrowly rounded behind, and a little pointed in front. Broad anterior point bent ventrad where it meets the anterior extensions of the supracoxal folds, from which it is separated by a depressed line. Length, 3.12 mm.; width, 2.1 mm.

Mammillae.—Numerous and of various sizes and forms. Those in the median dorsal area large, crowded, of irregular shapes, flattened on top and each with a central pit which may bear a hair; those in the anterior marginal areas on the dorsum much as in the median area but smaller and with the hairs more frequent; on the venter with a distinct transverse band extending from side to side just posterior to coxae IV, in which the mammillae are unique among all known species. The ends of this band extend over the lateral margins to the dorsum and are visible from above. It also has anterior extensions onto the supracoxal folds and in the median area between the coxae. At the margins these mammillae are elevated, columnar, about twice as high as their diameters, convex on top and each with a single fine hair; height of the mammillae diminishing progressively from margins to the median area where they are only slightly elevated and yet retain a sharp margin of the convex top, which readily distinguishes them from the nearby mammillae. The surface of the derm between these modified mammillae is finely and evenly pebbled.

Discs.—Large, distinct, a little depressed and with their surfaces shining; not apparent on the venter.

Legs.—With numerous barbed hairs which are shorter and more barbed on the dorsal surfaces, larger and less barbed on ventral surface. Surface shining and with transverse wrinkles. Length of tarsus I, 0.42 mm.; metatarsus, 0.3 mm. Length of tarsus IV, 0.50 mm.; metatarsus, 0.4 mm. Subapical dorsal projections and dorsal humps absent.

Coxae.—Coxae I and II a little separated; all other coxae contiguous.

Hood.—No well-developed hood is present though the anterior

[1] From the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

FIGURE 1.- *Ornithodoros viguerasi* n. sp. Adult, dorsal and ventral view.

projection of the dorsal body wall is bent downward and resembles a hood, affording some protection for the mouth parts.

Cheeks.—Conical projections about as long as the diameter at the base and bearing a few short, fine hairs.

Capitulum.—Basis capituli with the surface irregular but shining, with a median longitudinal elevation. Only the anterior portion of the basis capituli is visible in the type female and it is not evident whether the capitulum is protrusile in the adult as in the nymph. Palpal article 1 is long, about as long as articles 2 and 3 combined. Article 4, conical.

Hypostome.—Small, flattened, in the shape of an inverted V; denticles not evident when examined *in situ*. Posthypostomal hairs placed far behind the insertion of the hypostome and very long. Length from hairs to apex, about 0.18 mm. (Described *in situ*.)

Folds and plates.—Coxal and supracoxal folds present. Coxal fold with a shining sclerotized plate bordering coxae II, III, and IV (see fig. 2). Supracoxal fold similarly sclerotized from opposite coxa III to the anterior end. There is also a similar plate anterior to the sexual opening between coxae I.

Grooves.—Preanal groove distinct at the sides but interrupted in the middle. Transverse postanal groove deep and continuous from the two lateral margins. Median postanal groove deep and terminating at the transverse postanal groove. Dorso-ventral groove absent.

Sexual opening.—At the level of the intervals between coxae I and II.

Eyes.—Absent.

Anus.—In an elliptical pattern.

NYMPH

Nymphs and adults are readily distinguishable. The late stage nymphs measure 3.0 by 1.95 mm. and differ from the adult in possessing a definite sclerotized plate posterior to the position of the sexual opening and in lacking a transverse plate between coxae I anterior to the sexual opening found in the female. Late nymphs also differ from the female in having mammillae in the margins of the transverse band only about as much elevated as the other mammillae of this species. The first nymphal stage, without feeding since ecdysis from the larva, measures 2.85 by 1.95 mm., thus differing from the length of the female by only 0.27 mm. The first nymphal stage lacks the transverse band of modified mammillae. The late nymphal stages lack also the definite modification of mammillae in the posterior median margin of the dorsum as described in the adult.

In the nymphs the capitulum is very long, protrusile, and attached by a soft "neck." When extended the capitulum reaches beyond the anterior point of the body.

Hypostome.—Pointed apically, broad at the base, the two post-hypostomal hairs arising from the tumescent base. The denticles are faint, scarcely visible even in mounted specimens. Length about 0.15 mm.

Nymphs are misleading in appearing to have a sexual opening. This

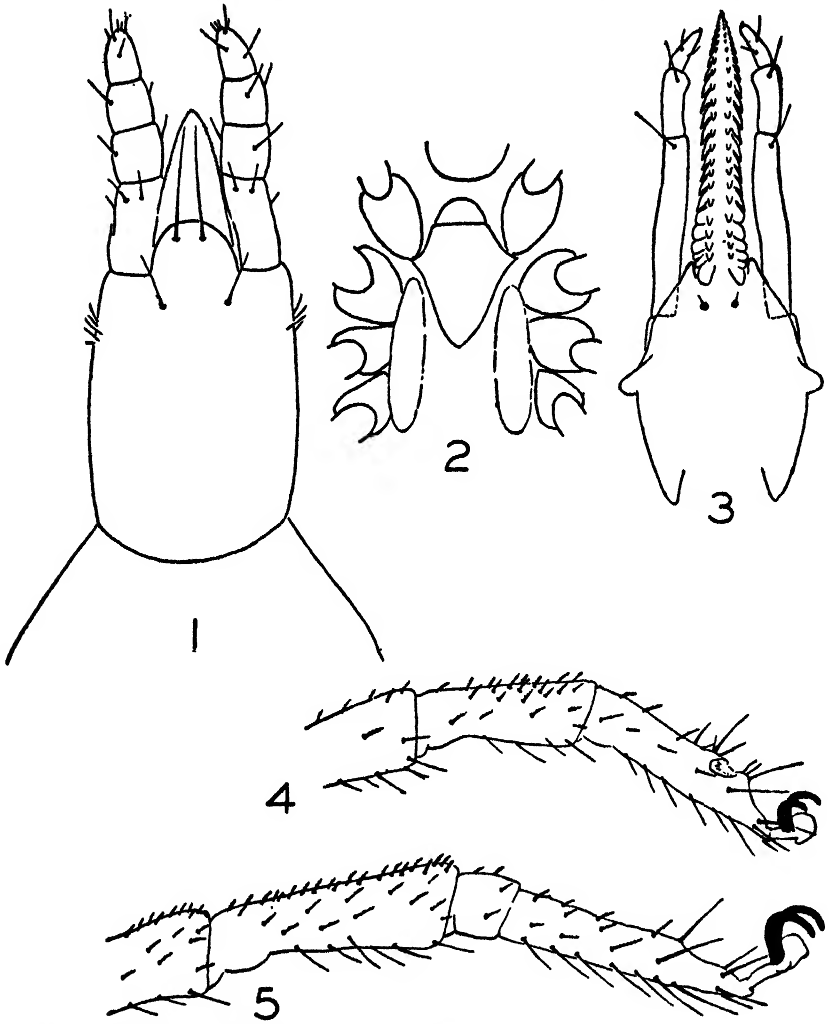

FIGURE 2.—*Ornithodoros viguerasi* n. sp. 1. Nymph, capitulum, ventral view. 2. Nymph, ventral view showing sclerotized plates and coxae. 3. Larva, capitulum, ventral view. 4. Nymph, tarsus and metatarsus of leg I. 5. Nymph, tarsus and metatarsus of leg IV.

is due to a sclerotized semicircular flap and just posterior to it a large, smooth, sclerotized plate (see fig. 2). Coxal folds have oval sclerotized plates bordering on coxae II, III, and IV, but the supracoxal folds are mammillated and lack the long, definite sclerotized plates found in adults.

LARVA

Specimens described as larvae are from large fed larvae which later molted into nymphs of this species.

Engorged larva (not necessarily fully fed) oval, widest in front of the middle, bluntly pointed in front, rounded behind. Length (not including the mouth parts) 2.64 mm., width 1.95 mm.

Larval derm striated as in other species but lacking the dorsal patch with a different pattern of markings found in some species. Leg I distant from the insertion of the mouth parts. Legs separated by about the same distance as that from leg I to the mouth parts.

Basis capituli long with a knob on each side and with two horns on the posterior lateral corners. Mouth parts very long and slender; mounted in balsam, articulation between palpal articles 1 and 2 not visible.

Hypostome long and narrow; length about 0.27 mm., denticles 2/2; principal denticles in the lateral files relatively long and sharp, except at the basal end where they are rounded and blunt; those of the median files small and short. Posthypostomal hairs very small and short.

It is notable that while the fed larva measures 2.64 mm. in length the one known adult measures only 3.12 mm.

Holotype, 17169, a female from bat cave, Cueva Somorrostro, near Jamaica, Cuba, September 19, 1940.

Paratypes, 17168, 1 nymph, September 19, 1940; 17164, 11 nymphs, September 20, 1940; 17172, 1 nymph, September 1940; 17277, 1 nymph, October 8, 1940; 17295, 3 nymphs, 4 larvae, from "bat." All are from Cueva Somorrostro, near Jamaica, Cuba. Dr. Vigueras informs us that the species of bat inhabiting this cave is *Phyllonycteris poeyi* Gundlach.

Paratypes have been placed in the United States National Museum, Washington, D. C., Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; Division of Entomology and Parasitology, University of California, Berkeley, Calif.; and Division of Entomology and Economic Zoology, University of Minnesota, Minneapolis, Minn. The holotype and remaining paratypes are in the collection of the Rocky Mountain Laboratory.

PLAGUE INFECTION REPORTED IN THE UNITED STATES DURING 1940

IN HUMAN BEINGS

One human case of bubonic plague was reported in the United States during 1940. The case occurred in a boy, 13 years of age, living in Emmett, Gem County, Idaho. The onset of illness occurred on June 10, but the condition was not immediately recognized as

plague. The diagnosis was subsequently proved, however, bacteriologically and by animal inoculation. The patient recovered.

The locality in which this case was reported is close to the eastern counties of Oregon which are known to be infected with rodent plague. Investigation revealed that the patient had contact with rabbits and carniverous birds shortly before the onset of illness.

IN RODENTS AND PARASITES

Plague infection in wild rodents and parasites from rodents and from a rabbit was reported during 1940 in five Western States—California, Nevada, Oregon, Washington, and Wyoming. It was found for the first time in Park County, Wyo. Infection was demonstrated by the method of mass inoculation with emulsion of parasites, by laboratory examination, or by inoculation with tissue from infected animals.

Plague infection reported in wild rodents and parasites from rodents and rabbit

State and county	Date [1]	Infection found in—
California:		
San Bernardino County.	July 15	Pool of 38 fleas from 21 golden mantled ground squirrels (*Citellus lateralis chrysodeirus*).
Do	July 24	1 ground squirrel (*C. beecheyi fisheri*).
Do	July 26	Pool of 29 fleas from 17 ground squirrels (*C. beecheyi fisheri*).
Do	July 30	Tissue from 4 ground squirrels (*C. beecheyi fisheri*).
Do	Aug. 13	Pool of 129 fleas from 15 ground squirrels (*C. beecheyi fisheri*).
Do	Aug. 20	Pool of 91 fleas from 44 golden mantled ground squirrels (*C. lateralis chrysodeirus*).
Nevada:		
Elko County	May 1	Tissue from 2 ground squirrels (*C. beldingi oregonus*) found dead; pool of 20 fleas from 6 ground squirrels (same species); and tissue from 1 ground squirrel (*C. richardsoni nevadensus*).
Oregon:		
Lake County	May 31	Marmot (*Marmota flaviventris*).
Washington:		
Lincoln County	May 28	Pool of 105 fleas from 21 ground squirrels (*C. washingtoni washingtoni*).
Do	May 29	159 fleas from 29 ground squirrels (*C. washingtoni washingtoni*).
Spokane County	May 27	Tissue and pool of 36 fleas from 1 ground squirrel (*C. columbianus columbianus*) found dead.
Do	May 29	Pool of 72 fleas from 21 ground squirrels (*C. columbianus columbianus*).
Do	May 31	Pool of 36 fleas from a cottontail rabbit (*Sylvilagus nuttallii nuttallii*).
Wyoming:		
Park County	July 5	Pool of 14 lice from 1 marmot (*M. flaviventris*). (First proof of plague infection in this county).
Sublette County	July 24	Pool of 65 fleas from 14 ground squirrels (*C. armatus*).
Do	Aug. 21	Tissue from 1 ground squirrel, pool of 54 fleas from 22 ground squirrels, and pool of 18 fleas from 14 ground squirrels (all *C. armatus*).
Do	Aug. 28	Pool of 15 fleas from 12 ground squirrels (*C. armatus*).

[1] Dates of reports that infection had been proved.

COURT DECISION ON PUBLIC HEALTH

Recovery of damages because of contraction of silicosis.—(Pennsylvania Supreme Court; *Rebel* v. *Standard Sanitary Mfg. Co.*, 16 A. 2d 534; decided December 4, 1940.) In an action to recover damages the plaintiff alleged that he had contracted silicosis while in the employ of the defendant company as a result of the latter's violation of the following provision of a Pennsylvania statute regulating

employment in industrial establishments: "Exhaust fans of sufficient power, or other sufficient devices, shall be provided for the purpose of carrying off poisonous fumes and gases, and dust from emery-wheels, grind-stones and other machinery creating dust." The plaintiff presented proof to the effect that although there were exhaust fans in the grinding and sand-blasting room they were not sufficient to carry off the dust in that room and that this deleterious substance permeated the atmosphere of the welding room where plaintiff was employed, which room was separated from the grinding and sand-blasting room by a 12-foot roofed alley.

The plaintiff prevailed in the trial court and the defendant appealed, its principal contention before the supreme court being that the statute added nothing to the responsibility of the employer or to the right of the employee and that, therefore, the plaintiff could not recover until he had shown the availability or practicability of more sufficient devices for the prevention of dust. With this argument the appellate court said that it could not agree. That this legislation, said the court, placed a definite responsibility upon the employer could not be successfully controverted, for it was well settled that a violation of the statute, which resulted in injury to the employee, made the employer liable in a common law action for damages. "There was no burden upon plaintiff to establish that more efficient devices than those used by defendant for the prevention of dust were available. All plaintiff was required to show was that the exhaust fans in use were not proper or sufficient compliance with the provisions of the statute."

Also the court was of the view that the defense of assumption of risk was not permissible, as there was nothing in the employment as a welder that presupposed any scientific knowledge "such as a knowledge of the properties of silica dust and their injurious effect upon the body."

Respecting the word "sufficient" used in the statute, the court stated that it was a relative term depending upon the facts of each case.

Another claim made by the defendant was that the above-quoted statute had no bearing upon the controversy since it had been repealed without a saving clause, but the court found no merit in this contention, saying that the vested right under the provisions of the statute which plaintiff had immediately upon the injury occurring in 1935 could not be impaired by the 1937 repealing statute. "It is well settled that the repeal of a statute cannot deprive a plaintiff of his cause of action under it for damages for injury either to person or property."

The judgment of the lower court in favor of the plaintiff was affirmed

DEATHS DURING WEEK ENDED FEBRUARY 15, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 15, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,731	9,751
Average for 3 prior years	9,451	
Total deaths, first 7 weeks of year	69,321	67,941
Deaths under 1 year of age	478	534
Average for 3 prior years	544	
Deaths under 1 year of age, first 7 weeks of year	3,829	3,843
Data from industrial insurance companies:		
Policies in force	64,701,811	66,256,632
Number of death claims	12,490	12,586
Death claims per 1,000 policies in force, annual rate	10.1	9.9
Death claims per 1,000 policies, first 7 weeks of year, annual rate	10.6	10.4

SUMMARY OF MORTALITY IN 90 CITIES

Provisional Data for 52 Weeks Ended December 28, 1940, and Comparison With Data for 1939

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Provisional [1]		Final [2]
	1940	1939 [3]	1939
Total deaths, 90 cities	439,423	429,419	435,227
Deaths under 1 year of age	26,434	25,724	26,971
Infant mortality rate	39	41	40

[1] Based on weekly telegraphic reports from city health officers.
[2] Calendar year; based on transcripts received from State registrars' offices.
[3] Exclusive of data for Elizabeth and Sacramento.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 22, 1941

Summary

With the single exception of measles, no unusual incidence or significant increase over last week was indicated by the current reports of the nine communicable diseases included in the following table.

The number of cases of influenza for continental United States dropped from 21,989 for the preceding week to 13,688. Alaska reported 2,059 cases as compared with 29 last week. The incidence of diphtheria, scarlet fever, smallpox, and typhoid fever was not only lower than that for the corresponding period of any of the preceding 5 years, but the numbers of cases of each of these diseases reported to date this year are below the cumulative totals for the corresponding period of each of the preceding 5 years. As these diseases apparently reached new low levels in 1940, the current incidence is especially favorable.

The incidence of measles for the current week increased 30 percent as compared with the preceding week, while the total number of cases reported this year to date is more than two and one-third times the 5-year (1936–40) median and over three times the number reported for the corresponding period last year. The highest incidence is in the Middle Atlantic, East North Central, South Atlantic, New England, and East South Central areas.

The incidence of poliomyelitis declined during the current week, but it is higher than in all but one (1940) of the preceding 5 years, while the cumulative total for the current year is above that for any of the preceding 5 years. For the current period, however, no State reported more than 3 cases.

Of 37 cases of smallpox, 31 cases, or 84 percent, were reported from the North Central States. Two cases of tularemia were reported in North Carolina; and of 20 cases of endemic typhus fever, 11 cases occurred in Georgia. The seasonal appearance of Rocky Mountain spotted fever in the Northwest is indicated by 1 case each in Montana and Wyoming.

The death rate for the current week for 92 major cities of the United States was 12.6 per 1,000 population, as compared with 13.6 for the preceding week and with a 3-year (1938–40) average of 13.1 (88 cities).

Telegraphic morbidity reports from State health officers for the week ended February 22, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occured.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Feb. 22, 1941	Feb. 24, 1940		Feb. 22, 1941	Feb. 24, 1940		Feb. 22, 1941	Feb. 24, 1940		Feb. 22, 1941	Feb. 24, 1940	
NEW ENG.												
Maine	0	0	1	11	------	5	138	214	44	0	0	0
New Hampshire	0	0	0	16	------	------	15	49	24	0	0	0
Vermont	0	0	0	------	------	------	13	5	5	0	0	0
Massachusetts	1	4	4	------	------	------	376	292	357	4	1	2
Rhode Island	0	0	0	------	------	------	0	111	32	1	0	2
Connecticut	0	0	2	63	2	5	37	185	185	0	0	0
MID. ATL.												
New York	23	25	31	[1] 162	44	[1] 45	4,910	319	1,273	0	1	8
New Jersey	18	8	10	310	42	42	1,256	87	100	2	1	1
Pennsylvania	13	25	41	------	------	------	3,433	98	219	3	11	6
E. NO. CEN.												
Ohio	16	22	29	390	32	32	2,190	11	99	0	0	7
Indiana	13	13	13	29	66	66	226	5	11	0	0	0
Illinois	18	29	29	54	61	64	2,471	37	36	0	2	2
Michigan [3]	1	7	15	53	------	4	2,396	228	228	1	0	2
Wisconsin	2	1	1	273	183	183	662	312	312	0	0	1
W. NO. CEN.												
Minnesota	1	0	1	61	7	1	7	291	168	1	2	0
Iowa	7	4	4	300	42	14	195	158	66	1	1	1
Missouri	8	10	19	53	42	175	78	3	9	1	0	3
North Dakota	1	3	1	40	23	10	12	3	3	0	0	0
South Dakota	2	0	1	6	1	1	5	2	1	0	0	0
Nebraska	2	1	5	15	------	------	4	29	33	0	2	1
Kansas	3	10	9	45	78	22	272	417	20	0	3	0
SO. ATL.												
Delaware	1	0	0	------	------	------	216	1	21	0	0	0
Maryland [3]	2	0	5	103	107	107	77	4	136	2	0	2
Dist. of Col. [3]	1	5	10	18	8	8	59	2	8	1	0	1
Virginia	13	18	17	1,959	2,430	------	1,338	27	223	3	4	4
West Virginia [3]	5	8	9	294	1,733	131	112	13	13	3	1	3
North Carolina	10	10	23	435	64	173	343	124	124	0	0	2
South Carolina [3]	1	5	4	2,246	1,182	1,182	237	16	34	4	1	2
Georgia [3]	2	8	8	736	385	385	349	197	197	1	2	2
Florida [3]	1	6	6	127	38	35	145	65	65	0	0	0
E. SO. CEN.												
Kentucky	6	10	9	117	115	115	560	44	154	0	2	9
Tennessee	9	6	11	604	307	246	123	133	133	3	1	8
Alabama [3]	13	11	14	1,483	699	699	294	44	44	3	1	3
Mississippi [3]	1	9	6	------	------	------	------	------	------	1	0	1
W. SO. CEN.												
Arkansas	4	7	9	286	997	233	107	3	3	2	1	1
Louisiana [3]	5	6	14	96	110	24	5	18	18	0	0	2
Oklahoma	2	8	7	310	487	227	14	7	12	1	0	1
Texas [3]	31	44	38	1,910	3,448	754	463	414	310	2	1	6
MOUNTAIN												
Montana [4]	1	1	2	55	8	57	3	33	30	0	0	0
Idaho	1	1	1	------	1	7	12	186	44	0	0	0
Wyoming [4]	2	2	1	52	------	------	36	22	4	0	0	0
Colorado	7	8	8	61	35	------	147	32	32	0	0	1
New Mexico	1	1	1	32	19	6	85	1	21	1	0	0
Arizona	3	3	3	196	291	215	175	16	21	0	1	1
Utah [3]	2	0	0	43	19	------	8	273	155	1	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	5	1	3	11	56	1	141	529	236	1	0	1
Oregon	0	6	2	41	37	84	235	351	28	1	0	0
California	8	23	32	[5] 592	705	705	99	408	408	1	3	3
Total	266	369	498	13,688	13,904	11,870	24,079	5,819	8,126	45	42	101
8 weeks	2,382	3,395	4,584	530,126	112,641	38,450	113,391	37,660	47,669	354	307	755

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 22, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Feb. 22, 1941	Feb. 24, 1940		Feb. 22, 1941	Feb. 24, 1940		Feb. 22, 1941	Feb. 24, 1940		Feb. 22, 1941	Feb. 24, 1940	
NEW ENG.												
Maine	0	0	0	9	13	18	0	0	0	0	0	0
New Hampshire	0	0	0	4	1	16	0	0	0	0	0	0
Vermont	0	0	0	6	13	13	0	0	0	0	0	0
Massachusetts	0	1	0	105	105	241	0	0	0	1	1	1
Rhode Island	0	0	0	5	20	17	0	0	0	0	0	0
Connecticut	0	0	0	39	101	100	0	0	0	1	5	0
MID. ATL.												
New York	1	0	0	410	731	740	0	0	0	5	0	5
New Jersey	1	1	0	270	367	187	0	0	0	1	0	1
Pennsylvania	1	3	1	330	597	561	0	0	0	5	5	4
E. NO. CEN.												
Ohio	0	1	0	262	240	482	4	0	7	4	5	3
Indiana	1	1	1	167	186	217	2	0	8	0	4	1
Illinois	1	1	1	432	656	656	1	6	11	3	5	4
Michigan [1]	3	0	0	232	272	585	0	0	3	3	0	3
Wisconsin	1	5	0	139	174	338	4	6	6	0	4	1
W. NO. CEN.												
Minnesota	0	0	0	37	106	169	2	6	9	0	0	0
Iowa	0	1	0	55	102	178	10	9	34	1	7	1
Missouri	0	0	0	97	87	215	1	12	12	0	0	1
North Dakota	0	0	0	14	50	47	0	1	10	0	1	1
South Dakota	0	0	0	29	22	22	4	0	4	0	0	0
Nebraska	0	0	0	33	21	94	0	0	8	0	0	0
Kansas	0	2	0	45	82	209	3	0	9	1	2	0
SO. ATL.												
Delaware	0	0	0	16	13	6	0	0	0	0	0	0
Maryland [2]	0	0	0	65	43	53	0	0	0	1	0	0
Dist. of Col. [2]	0	0	0	18	25	20	0	0	0	0	0	1
Virginia	2	2	0	41	50	35	0	0	0	5	0	2
West Virginia [2]	0	2	0	37	56	51	0	0	0	0	2	3
North Carolina	2	1	1	47	36	36	0	0	0	0	0	4
South Carolina [3]	0	0	0	15	2	5	0	0	0	7	3	3
Georgia [3]	0	1	0	30	19	14	0	1	0	0	2	2
Florida [3]	3	0	1	5	4	6	0	0	0	1	2	1
E. SO. CEN.												
Kentucky	0	0	0	124	84	74	0	0	0	4	4	3
Tennessee	0	0	0	92	86	39	0	0	0	3	1	2
Alabama [3]	0	0	2	26	23	12	1	0	0	1	2	2
Mississippi [2]	1	2	0	8	10	10	0	0	0	1	1	1
W. SO. CEN.												
Arkansas	1	0	0	6	14	14	2	0	5	3	2	1
Louisiana [3]	1	0	0	8	12	14	0	0	0	1	7	7
Oklahoma	0	0	0	13	12	31	1	1	6	2	0	0
Texas [3]	2	3	1	41	53	87	1	4	4	4	5	5
MOUNTAIN												
Montana [4]	1	0	0	33	33	47	0	0	11	2	0	0
Idaho	0	0	0	10	14	19	0	0	4	0	0	0
Wyoming [4]	0	0	0	8	6	13	0	0	1	0	0	0
Colorado	0	0	0	25	81	73	1	17	14	2	0	0
New Mexico	0	0	0	5	13	24	0	1	0	0	1	0
Arizona	0	0	0	9	4	15	0	0	0	0	1	0
Utah [2]	1	0	0	3	26	37	0	0	0	1	0	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	0
PACIFIC												
Washington	1	0	0	32	66	63	0	1	5	0	0	1
Oregon	0	0	0	9	24	45	0	0	4	1	2	2
California	2	3	1	151	156	219	0	0	9	3	4	4
Total	26	30	18	3,597	4,911	6,358	37	65	283	67	78	82
8 weeks	271	260	174	26,486	35,766	48,076	378	573	2,364	559	617	885

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended February 22, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough	
	Week ended	
	Feb. 22, 1941	Feb. 24, 1940
NEW ENG.		
Maine	22	49
New Hampshire	0	6
Vermont	4	23
Massachusetts	172	124
Rhode Island	18	12
Connecticut	60	27
MID. ATL.		
New York	276	354
New Jersey	90	55
Pennsylvania	398	267
E. NO. CEN.		
Ohio	269	67
Indiana	13	24
Illinois	67	105
Michigan [2]	314	100
Wisconsin	146	97
W. NO. CEN.		
Minnesota	38	19
Iowa	38	9
Missouri	26	11
North Dakota	46	7
South Dakota	4	0
Nebraska	22	12
Kansas	129	39
SO. ATL.		
Delaware	5	4
Maryland [2]	82	153
Dist. of Col.[3]	7	24
Virginia	97	54
West Virginia [2]	34	43
North Carolina	368	65
South Carolina [3]	133	14
SO. ATL.—continued		
Georgia [3]	22	23
Florida [3]	7	8
E. SO. CEN.		
Kentucky	55	47
Tennessee	57	32
Alabama [3]	34	19
Mississippi [2]	---	---
W. SO. CEN.		
Arkansas	44	10
Louisiana [3]	2	30
Oklahoma	22	1
Texas [3]	340	111
MOUNTAIN		
Montana [4]	24	4
Idaho	28	44
Wyoming [4]	3	6
Colorado	69	3
New Mexico	17	23
Arizona	37	23
Utah [2]	70	100
Nevada	0	---
PACIFIC		
Washington	101	26
Oregon	5	36
California	280	198
Total	4,095	2,508
8 weeks	33,208	22,093

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Feb. 22, 1941, 20 cases as follows: District of Columbia, 1; South Carolina, 1; Georgia, 11; Florida, 2; Alabama, 2; Louisiana, 1; Texas, 2.
[4] Rocky Mountain spotted fever, week ended Feb. 22, 1941, 2 cases as follows: Montana, 1; Wyoming, 1.
[5] Delayed reports of 238 cases included.

MONTHLY REPORTS FROM STATES

Case reports consolidated for the quarter October–December 1940

Division and State	Diphtheria	German measles	Influenza	Malaria	Measles	Meningitis, meningococcus	Ophthalmia neonatorum	Pellagra	Poliomyelitis	Puerperal septicemia	Rocky Mountain spotted fever	Scarlet fever	Smallpox	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Whooping cough
NEW ENG.																	
Maine	10	24	53	1	986	2	1	1	2	-	0	102	0	11	-	6	313
New Hampshire	1	-	2	-	13	0	-	-	3	-	0	52	0	3	-	1	59
Vermont	-	49	7	-	216	2	-	-	2	-	0	116	0	7	-	12	129
Massachusetts	43	109	-	2	2, 770	20	(1)	4	11	-	0	1, 387	0	26	-	12	2, 694
Rhode Island	7	5	1	1	21	3	-	-	4	-	0	81	0	7	1	2	81
Connecticut	5	21	27	-	59	4	1	-	4	-	0	302	0	21	-	38	1, 073
MID. ATL.																	
New York	122	413	-	23	7, 111	33	[2] 22	-	68	-	0	2, 515	0	146	8	86	5, 322
New Jersey	121	106	51	1	2, 716	7	28	-	26	-	0	1, 176	0	22	2	13	1, 826
Pennsylvania	172	116	-	5	9, 909	22	8	-	73	-	0	2, 296	0	136	1	37	7, 341
E. NO. CEN.																	
Ohio	170	60	303	4	700	13	-	1	265	5	0	2, 037	3	77	2	36	3, 667
Indiana	150	-	1, 465	8	212	10	-	-	163	-	1	1, 023	10	32	1	11	221
Illinois	260	75	114	25	5, 043	9	8	1	276	-	1	3, 263	67	82	-	49	2, 047
Michigan	118	114	81	11	6, 024	16	-	-	364	-	0	1, 952	50	30	-	23	4, 305
Wisconsin	8	11	451	-	3, 268	6	-	-	250	-	0	1, 450	46	11	-	40	1, 704
W. NO. CEN.																	
Minnesota	33	-	20	1	290	3	-	-	130	-	0	802	223	11	-	31	1, 051
Iowa	54	12	261	4	734	6	-	-	286	-	0	825	12	20	-	58	309
Missouri	119	-	60	7	117	10	-	-	115	-	0	661	6	79	-	7	664
North Dakota	47	4	299	-	51	5	-	-	19	-	0	132	17	7	-	-	245
South Dakota	21	-	1	-	25	2	-	-	23	-	0	243	6	4	-	1	45
Nebraska	12	-	5	-	93	2	-	-	85	-	0	224	8	5	-	-	154
Kansas	51	5	4, 151	3	431	3	-	1	107	-	0	919	4	20	-	22	1, 000
SO. ATL.																	
Delaware	7	-	-	-	70	1	-	-	1	-	0	91	0	4	-	-	364
Maryland	58	27	52	8	55	4	2	-	5	-	0	473	0	38	1	4	1, 048
Dist. of Col	25	-	15	-	22	1	-	-	1	-	0	128	0	5	-	1	120
Virginia	307	-	1, 864	16	683	19	-	9	120	-	3	620	0	87	2	5	895
West Virginia	92	-	197	1	139	9	-	1	202	-	0	544	2	39	1	1	397
North Carolina	564	63	68	208	315	10	-	13	20	-	1	1, 174	9	65	24	1	1, 925
South Carolina	463	42	3, 251	1, 817	166	0	8	338	3	-	0	2[illegible]7	0	38	18	13	352
Georgia	225	-	1, 399	379	125	5	-	45	9	1	0	438	0	95	219	21	170
Florida	84	-	112	38	18	1	-	25	15	-	0	46	1	37	22	4	73

See footnotes at end of table.

Case reports consolidated for the quarter October–December 1940—Continued

Division and State	Diphtheria	German measles	Influenza	Malaria	Measles	Meningitis, meningococcus	Ophthalmia neonatorum	Pellagra	Poliomyelitis	Puerperal septicemia	Rocky Mountain spotted fever	Scarlet fever	Smallpox	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Whooping cough
E. SO. CEN.																	
Kentucky	132		1,364	9	1,180	17		1	68		1	855	1	117		7	998
Tennessee	149	9	466	86	323	9	1	15	20	3	1	957	14	83	12	11	556
Alabama	246	2	937	1,738	237	23		45	15		0	376	0	60	96	8	262
Mississippi	150		21,211	6,357	433	7	26	807	12	86	0	209	2	19	23	7	1,775
W. SO. CEN.																	
Arkansas	155	2	7,067	582	392	1	2	48	8	3	0	187	12	97		10	258
Louisiana	151		14,510	174	15	7		14	42		0	124	3	107	41	32	191
Oklahoma	266		4,367	450	35	6	3	25	24		0	296	13	67	1	24	248
Texas	475		20,544	1,558	359	11	17	285	43		0	541	16	139	110	42	1,493
MOUNTAIN																	
Montana	48	12	1,204		97	3	1		16		0	228	7	10		1	48
Idaho	5	1	1,229		19	1			21		[3] 5	162	3	26		2	85
Wyoming	4	12	1,603		22	2			22	2	0	86	0	3			20
Colorado	61		1,010		551	2			14		0	297	4	27		9	326
New Mexico	12	9	138	71	329	1		10	5	1	0	86	0	55		1	195
Arizona	57	17	6,259	6	432	3		17	4		0	61	8	11	1	8	122
Utah	7	8	18,780	2	35	1			26		0	116	1	13		2	252
Nevada	4		2,433			0			1	2	0	5	1	3			6
PACIFIC																	
Washington	50	383	9,005	1	315	7			[4] 134		0	371	2	28		13	756
Oregon	42		6,460	15	162	3			21		0	173	31	18		1	138
California	238	247	45,543	26	717	15	13		71		0	1,295	6	91	8	63	3,742
Total	5,601	1,958	178,440	13,638	48,035	347	141	1,706	3,219	103	13	31,794	579	2,139	624	781	51,065
Alaska		1	347		67	1								3			
Hawaii	19	103	16,038		417							1		5	11	2	50
Puerto Rico [5]	230		79,413	6,637	361	4	3	14	4	41		1		75			358

[1] 143 cases of ophthalmia neonatorum and suppurative conjunctivitis reported.
[2] Exclusive of New York City.
[3] Delayed reports.
[4] Delayed reports included.
[5] Reports for June to September, inclusive.

Case reports consolidated for the quarter October–December 1940—Continued

Division and State	Actinomycosis	Chickenpox	Dysentery, amoebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	Encephalitis, equine	Hookworm disease	Mumps	Rabies in animals	Rabies in man	Septic sore throat	Tetanus	Trachoma	Trichinosis	Tularemia	Vincents' infection
NEW ENG.																	
Maine		729							199			4	1		2		6
New Hampshire		55							170			4					
Vermont		762		4					237			4					79
Massachusetts	2	3,439	2	36		2			1,180	16		44	2	4	14		
Rhode Island		205	1	1					64	3	[1] 1	38				1	
Connecticut		1,364	1	16		1			603			48		2	6	1	
MID. ATL.																	
New York		7,750	17	215		21				[2] 27	2	192	11		55		[2] 147
New Jersey		4,816	14	4		3			2,203	56	1	24	5	1	14	1	
Pennsylvania		10,455	18	6		10			4,293						2	6	
E. NO. CEN.																	
Ohio		4,472	4	81		2			505		1	37	6	15	12	48	
Indiana		1,015		4		1			293	57		6	1			76	
Illinois	4	4,752	17	61		7			1,996	56		6	10	122	3	137	76
Michigan	1	4,924	7	5		2		1		1		285	6		1	9	58
Wisconsin		6,926				3			1,687			24		1		10	
W. NO. CEN.																	
Minnesota	3	2,632	6	4		1				2		28	1	2	1	3	
Iowa		931		4		1			452	[3] 28		3				16	
Missouri		584		7		1			56			22		156		40	
North Dakota	1	371			2	5			231			3		1			6
South Dakota		266							29			3		14			
Nebraska		367				1			24			4					
Kansas		1,297	1	6	5	8			40			23	1			15	45
SO. ATL.																	
Delaware		182							24								
Maryland		875	3	34	11	1			151			46			10	4	57
Dist. of Col.		164														1	
Virginia		867	2	296		3			239			323	2	1		11	
West Virginia		509		60		1			229			2				4	
North Carolina		1,184		2							1	25		1		4	26
South Carolina		204	4					256	168	44	1		1			3	
Georgia		315	21	48				2,672	114			136		2		19	
Florida		57	12			5		1,334	39	2		5	1			8	9

See footnotes at end of table.

Case reports consolidated for the quarter October–December 1940—Continued

Division and State	Actinomycosis	Chickenpox	Dysentery, amoebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	Encephalitis, equine	Hookworm disease	Mumps	Rabies in animals	Rabies in man	Septic sore throat	Tetanus	Trachoma	Trichinosis	Tularemia	Vincents' infection
E. SO. CEN.																	
Kentucky		1,029	3	132		4			1,371		1	144				85	
Tennessee	1	544	3	45		1			233			54	6	133		11	29
Alabama		313	1			2			153	42			8			3	
Mississippi		1,342	328	968				1,683	812	14				41			
W. SO. CEN.																	
Arkansas		230	15	15				3	429	46		120	1	346	1	4	
Louisiana		63	12	10				156	11	12		24	12	94		7	
Oklahoma		195	7	101		2			79	18		142	6	128		10	31
Texas		1,083	36	235		3			425	19				10		5	
MOUNTAIN																	
Montana		780		3		3			62			11		9		2	
Idaho		391							250			6				1	7
Wyoming		281			1	2			184			8			1	11	2
Colorado		1,167	4	1		2			289			31				6	
New Mexico	1	140	4	23	22				128	49		7					
Arizona		251			347	1			256					116		1	
Utah		1,039	2			2			147			7		220		2	
Nevada		56				2			19			1					
PACIFIC																	
Washington		1,644	5	13		8	5		1,180	4		13		4			8
Oregon		815	4	2		2			211	24		10		5			29
California		4,659	49	156		28			2,458	123		28	17	97	7	6	
Total	13	78,491	603	2,598	388	141	5	6,105	23,923	643	8	1,945	98	1,525	129	571	615
Alaska		115							1								2
Hawaii	1	73	1					31	21			1	5	5			
Puerto Rico [4]		82			120				13				56				

[1] Case occurred in August.
[2] Exclusive of New York City.
[3] Delayed reports included.
[4] Reports for June to September, inclusive.

Anthrax: Massachusetts, 3; New York, 4; New Jersey, 6; Pennsylvania, 7; Delaware, 1; Arkansas, 1; California, 2.
Dengue: South Carolina, 8; Florida, 1; Louisiana, 6; Texas, 2.
Diarrhea: Ohio, 268 (under 2 years; enteritis included); Michigan, 2 (infant diarrhea), Maryland, 60; South Carolina, 1,374.
Food poisoning: New Mexico, 1; Washington, 94; California, 136.
Granuloma, coccidioidal: California, 17.
Leprosy: Hawaii Territory, 9; Puerto Rico, 9; Pennsylvania, 1; Maryland, 1; Florida, 3; Louisiana, 3, Texas, 6.
Psittacosis. Connecticut, 1; Ohio, 1; California, 1.
Relapsing fever: Texas, 4; California, 6.
Weil's disease: Hawaii Territory, 1; Michigan, 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended February 8, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	155	1,272	141	3,652	932	1,812	32	377	18	1,074	-------
Current week	65	3,137	159	7,532	687	1,143	5	393	12	1,111	-------
Maine: Portland	0	------	0	1	8	0	0	0	0	2	33
New Hampshire:											
Concord	0	------	1	0	2	3	0	1	0	0	20
Manchester	0	------	1	0	1	5	0	0	0	0	35
Vermont:											
Barre	0	------	0	0	1	0	0	1	0	0	4
Burlington	0	------	0	0	0	0	0	0	0	0	11
Rutland	0	------	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	0	------	3	153	25	40	0	11	0	79	253
Fall River	0	------	1	0	0	2	0	1	0	8	36
Springfield	0	------	0	1	7	6	0	2	0	1	44
Worcester	0	------	0	85	5	8	0	2	0	5	56
Rhode Island											
Pawtucket	0	------	0	0	2	0	0	0	0	0	20
Providence	0	10	2	0	7	4	0	1	0	6	81
Connecticut:											
Bridgeport	0	12	1	1	5	2	0	0	0	2	39
Hartford	0	19	0	2	3	0	0	0	0	6	47
New Haven	0	1	2	0	4	17	0	0	0	14	56
New York:											
Buffalo	0	5	7	80	13	15	0	7	0	20	186
New York	11	427	16	2,357	136	189	0	103	2	116	1,920
Rochester	0	------	0	6	7	4	0	1	1	4	101
Syacuse	0	------	0	0	3	4	0	0	0	6	68
New Jersey:											
Camden	0	3	1	55	10	4	0	1	0	2	47
Newark	0	50	3	173	12	43	0	5	0	7	155
Trenton	0	13	1	6	6	59	0	2	0	1	36
Pennsylvania:											
Philadelphia	7	20	11	911	47	91	0	35	0	58	625
Pittsburgh	0	12	6	8	24	13	0	8	0	30	213
Reading	0	1	5	262	3	0	0	1	0	5	33
Scranton	0	------	-------	1	-------	1	0	-------	0	0	-------
Ohio:											
Cincinnati	3	36	2	34	14	9	0	8	0	2	190
Cleveland	2	275	0	785	12	22	0	13	0	76	243
Columbus	0	4	4	43	7	5	0	7	0	16	115
Toledo	0	4	1	2	4	3	0	5	0	22	97
Indiana:											
Anderson	0	------	0	1	2	0	0	1	0	1	9
Fort Wayne	0	------	0	13	4	1	0	1	0	0	33
Indianapolis	1	------	8	9	17	14	0	9	0	3	139
Muncie	0	------	1	3	2	7	0	0	0	2	14
South Bend	0	------	0	8	3	2	0	0	0	0	18
Terre Haute	0	------	0	0	4	0	0	0	0	0	19
Illinois:											
Alton	0	2	2	0	2	2	0	0	0	0	-------
Chicago	6	37	7	1,280	44	199	0	32	1	69	760
Elgin	0	------	0	6	3	0	0	0	0	0	10
Moline	0	------	0	9	0	2	0	0	0	0	9
Springfield	0	------	0	0	3	1	0	0	0	0	27
Michigan:											
Detroit	2	41	6	802	31	87	0	18	0	102	343
Flint	0	------	6	35	6	4	0	0	0	7	40
Grand Rapids	0	1	2	23	4	2	0	0	0	13	37
Wisconsin:											
Kenosha	0	1	0	19	0	1	0	0	0	1	15
Madison	0	------	0	2	0	8	0	0	0	1	15
Milwaukee	0	------	0	36	3	96	0	0	0	34	109
Racine	1	------	0	3	0	1	0	0	0	0	19
Superior	0	------	0	0	0	4	0	0	0	0	8
Minnesota:											
Duluth	0	------	1	0	3	1	3	0	0	9	30
Minneapolis	0	660	0	1	6	6	0	0	0	17	113
St. Paul	0	3	8	0	7	5	0	1	0	6	70

City reports for week ended February 8, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	------	------	0	------	0	0	------	0	0	------
Davenport	0	------	------	0	------	1	0	------	0	0	------
Des Moines	2	------	------	0	------	3	0	------	0	3	38
Sioux City	1	------	------	0	------	1	0	------	0	1	------
Waterloo	0	------	------	0	------	1	0	------	0	0	------
Missouri:											
Kansas City	0	------	1	10	8	8	2	4	0	21	84
St. Joseph	0	------	0	0	3	0	0	0	0	1	22
St. Louis	1	20	2	18	20	35	0	3	0	17	266
North Dakota:											
Fargo	0	------	0	0	1	2	0	0	0	4	6
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	------	0	------	0	0	------	0	1	3
South Dakota:											
Aberdeen	0	------	------	0	------	2	0	------	0	5	------
Sioux Falls	0	------	------	0	------	6	0	------	0	0	5
Nebraska:											
Lincoln	0	------	------	2	------	4	0	------	0	0	------
Omaha	0	------	0	0	4	7	0	0	0	1	56
Kansas:											
Lawrence	0	3	0	12	0	0	0	0	0	2	6
Topeka	0	1	1	16	0	1	0	1	0	0	22
Wichita	0	2	0	3	6	1	0	3	0	13	38
Delaware:											
Wilmington	0	------	0	18	4	2	0	3	0	3	44
Maryland:											
Baltimore	0	45	4	12	22	38	0	10	1	70	236
Cumberland	0	1	0	0	1	0	0	0	0	2	10
Frederick	0	------	0	0	0	0	0	0	0	0	7
Dist. of Col.:											
Washington	0	79	5	14	13	9	0	12	1	5	187
Virginia:											
Lynchburg	0	------	0	1	3	0	0	0	1	2	24
Norfolk	1	117	0	0	9	3	0	1	0	1	32
Richmond	0	171	1	4	7	1	0	5	0	1	65
Roanoke	0	------	0	121	2	1	0	0	0	11	18
West Virginia:											
Charleston	0	------	0	6	2	1	0	0	0	0	14
Huntington	1	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	1	1	3	2	0	0	0	11	22
North Carolina:											
Gastonia	0	------	------	1	------	0	0	------	0	4	------
Raleigh	0	100	1	10	3	0	0	0	0	25	13
Wilmington	1	------	------	1	------	0	0	------	0	0	------
Winston Salem	0	5	1	2	4	1	0	1	0	19	20
South Carolina:											
Charleston	1	413	1	10	2	2	0	1	0	2	27
Florence	0	31	0	4	1	0	0	0	0	0	9
Greenville	1	------	0	7	5	1	0	3	0	16	23
Georgia:											
Atlanta	0	27	5	1	0	6	0	5	0	0	86
Brunswick	0	------	0	0	2	0	0	1	0	0	5
Savannah	0	159	6	3	3	2	0	1	0	0	50
Florida:											
Miami	0	14	0	0	2	1	0	2	0	1	53
Tampa	2	1	1	0	0	0	0	0	0	0	32
Kentucky:											
Ashland	1	------	0	1	0	0	0	0	0	0	6
Covington	1	2	0	18	3	0	0	0	0	0	15
Lexington	0	------	0	0	3	0	0	0	0	1	19
Louisville	0	19	3	17	7	28	0	1	1	9	80
Tennessee:											
Knoxville	1	18	1	7	2	4	0	0	0	3	20
Memphis	1	28	5	20	5	5	0	4	0	12	85
Nashville	0	------	2	9	4	3	0	1	0	5	53
Alabama:											
Birmingham	1	166	5	6	7	8	0	2	1	5	85
Mobile	0	13	4	4	0	1	0	0	0	0	31
Montgomery	2	2	------	4	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	0	------
Little Rock	0	23	1	4	4	0	0	2	0	1	20
Louisiana:											
Lake Charles	0	------	------	0	------	0	0	------	0	0	7
New Orleans	0	37	4	0	14	1	0	7	1	1	173
Shreveport	1	------	0	0	2	0	0	2	0	0	54

City reports for week ended February 8, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Oklahoma:											
Oklahoma City	1	57	2	1	6	5	0	0	0	2	44
Tulsa	1		0	1	9	0	0	1	0	20	23
Texas:											
Dallas	1	1	1	4	4	9	0	1	1	0	71
Fort Worth	0		0	86	4	1	0	2	0	0	42
Galveston	0		1	0	0	0	0	1	0	0	12
Houston	1	1	2	0	6	0	0	3	0	1	79
San Antonio	2	9	2	0	6	1	0	7	0	2	78
Montana:											
Billings	4		0	0	0	0	0	0	0	0	6
Great Falls	0		0	3	2	1	0	0	0	0	5
Helena	0	29	0	0	0	0	0	0	0	1	6
Missoula	0		0	0	0	0	0	0	0	0	7
Idaho.										0	
Boise	0		0	0	1	0	0	0	0	0	4
Colorado:											
Colorado Springs	0		0	0	0	4	0	1	0	4	10
Denver	5	43	1	12	1	11	0	2	0	31	78
Pueblo	0		0	0	2	3	0	0	0	6	9
New Mexico:											
Albuquerque	0		0	0	1	0	0	0	1	0	8
Utah:											
Salt Lake City	1		0	3	0	2	0	2	0	10	34
Washington:											
Seattle	0		1	7	3	3	0	5	0	9	103
Spokane	0	2	1	2	0	2	0	0	0	5	30
Tacoma	0		0	1	2	1	0	2	0	4	35
Oregon											
Portland	1	3	0	15	5	2	0	1	0	1	92
Salem	0			1		0	0		0	0	
California											
Los Angeles	2	121	4	13	3	11	0	20	2	25	385
Sacramento	6	9	0	0	4	2	0	2	0	6	36
San Francisco	2		1	6	8	6	0	9	0	52	185

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases	State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
New York:				Virginia:			
Buffalo	2	0	0	Richmond	0	1	0
New York	3	0	0	South Carolina:			
Pennsylvania:				Florence	1	0	0
Pittsburgh	1	0	0	Georgia:			
Michigan:				Atlanta	1	1	0
Detroit	0	0	1	Tennessee:			
Missouri:				Knoxville	0	1	0
Kansas City	0	1	0	Alabama:			
St. Joseph	0	1	0	Birmingham	1	0	0
St. Louis	1	0	0	Mobile	1	0	0
Maryland:				California:			
Baltimore	0	0	1	San Francisco	1	0	0
Cumberland	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 2; Pittsburgh, 1; Detroit, 1; Florence, 1.
Pellagra.—Cases: Baltimore, 1; Charleston, 2; Brunswick, 1; Dallas, 1; San Francisco, 1.
Typhus fever.—Cases: Brunswick, 2; Savannah, 5; New Orleans, 1; Dallas, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 18, 1941.—During the week ended January 18, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		9	1	11	15	1	3	5	2	47
Chickenpox		4	2	152	501	54	23	47	115	898
Diphtheria		31		16	1	2	1			51
Influenza		187			128	9	4		343	671
Measles		303	16	134	452	233	111	423	571	2,243
Mumps				105	169	34	8	12	22	350
Pneumonia		15			31	1	2		18	67
Poliomyelitis				1						1
Scarlet fever		25	4	80	153	14	7	8	12	303
Trachoma									1	1
Tuberculosis	1	2	1	99	31	6				140
Typhoid and paratyphoid fever				22	5	2	3			32
Whooping cough		1		201	166	23	14	35	20	460

CUBA

Habana—Communicable diseases—4 weeks ended January 11, 1941.—During the 4 weeks ended January 11, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

	Cases	Deaths		Cases	Deaths
Diphtheria	25	1	Tuberculosis		8
Malaria	4		Typhoid fever	19	1
Scarlet fever	6				

ICELAND

Influenza.—On February 9, 1941, the American Consul at Reykjavik, Iceland, reported an epidemic of influenza in that city and also in Isafjordur. Especially severe bronchitis accompanied the influenza. Schools and theaters were closed.

JAMAICA

Vital statistics—Year 1939.—The following table shows the numbers of births and deaths reported in the island of Jamaica for the year 1939:

Number of births	37,474
Births per 1,000 population	31 64
Number of deaths	17,536
Deaths per 1,000 population	14.8
Deaths under 1 year per 1,000 live births	121
Deaths from:	
Appendicitis	43
Cancer and other malignant tumors	334
Congenital debility	1,671
Diarrhea and enteritis	484
Deaths from—Continued.	
Infantile convulsions (under 5 years of age)	1,184
Malaria	480
Nephritis, chronic	457
Pneumonia	566
Syphilis	517
Tuberculosis (pulmonary)	970
Typhoid fever	227
Unspecified causes	1,366

PANAMA CANAL ZONE

Notifiable diseases—October–December 1940.—During the months of October, November, and December 1940, certain notifiable diseases were reported in the Panama Canal Zone, including terminal cities, as follows:

Disease	October		November		December	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	5		3		7	
Diphtheria [1]	15		9	2	12	1
Dysentery (amoebic)	13	3	9	1	10	1
Dysentery (bacillary)	2	2	3	2	5	
Malaria	193	2	175	3	220	4
Measles	15		16		2	
Paratyphoid fever [1]					1	
Pneumonia		25		28		26
Poliomyelitis					1	
Tuberculosis		31		32		49
Typhoid fever [1]	3		1			
Whooping cough [2]	6	1	7		8	

[1] Exclusive of carriers.
[2] Canal Zone only.

SWITZERLAND

Notifiable diseases—October 1940.—During the month of October 1940, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	34	Paratyphoid fever	4
Chickenpox	136	Poliomyelitis	42
Diphtheria	84	Scarlet fever	516
German measles	17	Tuberculosis	288
Influenza	31	Typhoid fever	13
Measles	255	Undulant fever	12
Mumps	48	Whooping cough	289

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–November 1940	December 1940	January 1941—week ended—			
				4	11	18	25
ASIA							
Ceylon	C	1					
China:							
Dairen	C	2					
Foochow	C	625					
Hong Kong	C	848	19	3			
Macao	C	513					
Manchuria	C	31					
Shanghai	C	571					
Shantung Province	C	244					
India	C	[1] 43,094					
Bassein	C	104					
Bombay	C	13					
Calcutta	C	2,230	79				
Cawnpore	C	333					
Chittagong	C	4					
Karachi	C	65					
Madras	C	1					
Moulmein	C	16					
Porto Novo	C	1					
Rangoon	C	43	18				
Vizagapatam	C	21					
India (French)	C	34					
Indochina (French)	C	436					
Thailand	C	235					

[1] January to Aug. 10, 1940.

PLAGUE

Place		January–November 1940	December 1940	January 1941—week ended 4	11	18	25
AFRICA							
Algeria	C	22	1				
Plague-infected rats		2					
Belgian Congo	C	26					
British East Africa:							
Kenya	C	9					
Uganda	C	222					
Egypt	C	[1] 409					
Madagascar	C	551	47				[2] 51
Morocco [3]	C	30					
Rhodesia, Northern	C	1					
Senegal:							
Dakar	D	[4] 1					
Thies	C	1					
Tivaouane	C	3					
Tunisia: Tunis	C	10				1	1
Plague-infected rats		1					
Union of South Africa	C	[5] 35	2				

[1] Includes 5 cases of pneumonic plague.
[2] For the month of January 1941.
[3] A report dated May 11, 1940, also stated that there was an epidemic of bubonic plague in southern Morocco where several hundred cases had been unofficially reported.
[4] Imported.
[5] Includes 6 cases of pneumonic plague.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths]

Place		January–November 1940	December 1940	January 1941—week ended— 4	11	18	25
ASIA							
China.[6]							
Dutch East Indies:							
Java and Madura	C	350					
West Java	C	8					
India	C	[7] 14,438					
Bassein	C	18					
Cochin	C	1					
Plague-infected rats		5					
Rangoon	C	6					
Indochina (French)	C	4	1				
Thailand:							
Bangkok	C	3					
Plague-infected rats		2					
Bisnulok Province	C	3					
Chingmai	C	3					
Dhonpuri Province	C	1					
Jayanad Province	C	3					
Kamphaeng Bajr Province	C	29					
Kanchanapuri Province	C	12					
Koan Kaen Province	C	5					
Nagara Svarga Province	C	30					
Noangkhay Province	C	4					
Sukhodaya Province	C	22					
EUROPE							
Portugal: Azores Islands	C	3					
SOUTH AMERICA							
Argentina:							
Catamarca Province	C	8	2				
Cordoba Province	C	[8] 47	7				
Jujuy Province	C	9					
La Rioja Province	C	1					
Salta Province	C	8					
San Luis Province	C	1	1				
Santiago del Estero Province	C	80	5				
Tucuman Province	C	21					
Brazil:							
Alagoas State	C	9					
Pernambuco State	C	4					
Ecuador: El Oro Province	C	6					
Peru:							
Cajabamba Department	C	1					
Cajamarca Department	C	28					
Lambayeque Department	C	15					
Libertad Department	C	52					
Lima Department	C	56					
Piura Department	C	6					
Tumbes Department	C	[9] 20					
OCEANIA							
Hawaii Territory: Plague-infected rats		44	[10] 10	1			

[6] Information dated July 7 states that up to July 6, 17 cases of plague had been reported near Tungliao, Hsingan Province, China; and a report dated July 13 states that an outbreak of bubonic plague occurred along the Yunnan-Burma border in the districts of Loiwing, Chefang, Juili, and Muchieh. Information dated Aug. 17 states that 45 cases of plague with 36 deaths have occurred in Nungen District and a telegram dated Oct. 2 states that 15 cases of bubonic plague with 3 deaths occurred in Hsinking, Manchuria. During the week ended Nov. 16, 1940, an epidemic of bubonic plague was reported in Ningpo District, Chekiang Province, China.

[7] January to Aug. 10, 1940.

[8] Includes 15 cases of pneumonic plague.

[9] Includes 3 suspected cases.

[10] During the week ended Dec. 7, a positive mass inoculation of 12 rats and 1 mouse was also reported.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths]

Place		January–November 1940	December 1940	January 1941—week ended—			
				4	11	18	25
AFRICA							
Algeria	C	6				1	
Angola	C	186					
Belgian Congo	C	3,749					
British East Africa	C	59					
Dahomey	C	81	8				134
French Guinea	C	16					11
Gibraltar	C	[1] 1					
Ivory Coast	C	131	1		3		5
Nigeria	C	2,236					
Niger Territory	C	640	13		2		7
Nyasaland	C	75					
Portuguese East Africa	C	1					
Rhodesia:							
Northern	C	6					
Southern	C	249	10				
Senegal	C	149	11		16		
Sierra Leone	C	10					
Sudan (Anglo-Egyptian)	C	532	3		1		
Sudan (French)	C	3					
Union of South Africa	C	180					
ASIA							
Arabia	C	255					
China	C	907	8	8	2	4	1
Chosen	C	544					
Dutch East Indies—Sabang	C	4					
India	C	[2] 154,740					
India (French)	C	5					
India (Portuguese)	C	20					
Indochina (French)	C	1,561	42		19		14
Iran	C	177					
Iraq	C	774	161	52	28		
Japan	C	502				[3] 46	
Straits Settlements	C	1					
Sumatra	C	1					
Thailand	C	202	2		12		12
EUROPE							
France	C	[4] 4					
Great Britain	C	2					
Greece	C	23					
Portugal	C	504					
Spain	C	976	114	8		7	
Turkey	C	139					
NORTH AMERICA							
Canada	C	12	5				
Guatemala	C	35					
Mexico	C	55					1
SOUTH AMERICA							
Bolivia	C	288					
Brazil	C	3					
Colombia	C	1,915				1	
Ecuador	C	1					
Peru	C	212					
Venezuela (alastrim)	C	213	11				

[1] Imported.
[2] January to Aug. 10, 1940.
[3] For 3 weeks.
[4] For the month of June 1940.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January-November 1940	December 1940	January 1941—week ended—			
				4	11	18	25
AFRICA							
Algeria	C	1,965	181			33	
Belgian Congo	C	1,210					
British East Africa	C	2					
Egypt	C	3,636					
Eritrea	C	63					
Morocco	C	310					
Rhodesia, Northern	C	7					
Tunisia	C	539	112	23	45	24	58
Union of South Africa	C	292	6				
ASIA							
China	C	2,151	40	8			
Chosen	C	359					
India	C	3					
Indochina (French)	C	2					
Iran	C	253	3				
Iraq	C	158	1	2			
Japan	C	2					
Palestine	C	203					
Straits Settlements	C	11	1				
Sumatra	C	[1] 196					
Trans-Jordan	C	15					
EUROPE							
Bulgaria	C	154	1			1	9
France	C	1					
Germany	C	213	17	4			
Greece	C	39	4			1	1
Hungary	C	78	1		17		14
Irish Free State	C	10		1			
Lithuania	C	115					
Rumania	C	1,286	117	17		48	47
Spain	C	14					
Turkey	C	524					
Yugoslavia	C	282			6		
NORTH AMERICA							
Guatemala	C	301	8				
Mexico	C	202	9		1		1
Panama Canal Zone	C	3					
SOUTH AMERICA							
Bolivia	C	626					
Chile	C	357		1			
Ecuador	C	2					[2] 16
Peru	C	988					
Venezuela	C	12	2			1	
OCEANIA							
Australia	C	11	1				
Hawaii Territory	C	26	2		2		

[1] For the period May to August 1940, inclusive.
[2] For the month of January 1941.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-November 1940	December 1940	January 1941—week ended—			
				4	11	18	25
AFRICA							
Belgian Congo: Yatolet	C	1					
Cameroon: Nkongsamba	C	[1] 1					
French Equatorial Africa: Fort Archambault	C	[1] 1					
Gold Coast	C	1					
Ivory Coast	C	[2] 5	[1] 1				1
Nigeria:							
Ibadan	C	1					
Oshogbo	C	[1] 1					
Sudan (Anglo-Egyptian): Kordofan Province [3]	C	858					
Sudan (French): Segou	C	[1] 1					
Togo (French)	C	1					
SOUTH AMERICA							
Brazil:							
Bahia State	D	1					
Espirito Santo State	D	[4] 140					
Minas Geraes State	D	2					
Para State	D	1					
Rio de Janeiro State	D	[5] 5					
Santa Catarina State	D	2					
Colombia:							
Antioquia Department—San Luis	D	2					
Caldas Department—							
La Pradera	D	1					
Samana	D	1					
Victoria	D	1					
Cundinamarca Department	D		1				
Intendencias and Commissaries	C	1					
Meta Department	D	4	8	1			
Municipality of Jesus Maria	D	1					
Santander Department	D	3		1			
Tolima Department	D	2	4				

[1] Suspected.
[2] Includes 3 suspected cases.
[3] A report dated Nov. 13, 1940, also states that 8,000 cases of yellow fever with 800 deaths have been reported in Kordofan Province, Anglo-Egyptian Sudan.
[4] Includes 28 deaths from jungle type.
[5] Includes 1 death from jungle type.

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

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Public Health Reports

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CARBON MONOXIDE: ITS TOXICITY AND POTENTIAL DANGERS

Prepared by the DIVISION OF INDUSTRIAL HYGIENE, *National Institute of Health, United States Public Health Service*

Carbon monoxide is a toxic gas. Its toxic effects are similar to those of anoxemia because it combines with the red pigment of the blood (hemoglobin) and thus prevents the absorption and supply of oxygen to the tissues of the organism.

Physical-Chemical Properties of Carbon Monoxide.

Carbon monoxide, CO, has a molecular weight of 28.01, a specific gravity of 0.9671 (air =1), and its density is 1.2504 grams per liter (at 0° C. and 760 mm. Hg). It is a colorless and odorless gas, except in high concentrations (75 or 100 percent) when it has an appreciable garliclike odor. It melts at −207° C. and boils at −192° C. and its solubility in water decreases from 3.5 volumes percent at 0° C. to 1.5 volumes percent at 60° C. It may be adsorbed by dusts, as for instance by coal dust, and may be again liberated under certain conditions. At 650° C. it burns with a blue flame which is extinguished in air containing less than 13.4 percent oxygen, but it does not support combustion. Its explosive limits are between 12.5 and 74.2 volumes percent carbon monoxide in air.

Maximal Permissible Concentration of Carbon Monoxide.

The maximal permissible concentration of carbon monoxide in air is accepted as 100 parts per million or 0.01 percent by volume [1] (0.11 mg. per liter at 25° C. and 760 mm. Hg) with atmospheric oxygen not below 19 volumes percent (at 25° C. and 760 mm. Hg) for exposures not exceeding a total of 8 hours per day, and as 400 parts per million or 0.04 percent by volume (0.46 mg. per liter at 25° C. and 760 mm. Hg) for exposures not exceeding a total of 1 hour daily. It should be emphasized that, with concentrations greater than 100 parts per million, increased physical activity, increased humidity,

[1] These figures for the maximal permissible concentration of carbon monoxide have been accepted and published by the American Standards Association in its American Standard Allowable Concentrations of Carbon Monoxide-Z37.1-1941. Copies of the standard may be obtained from the American Standards Association, 29 West Thirty-ninth Street, New York, N. Y.

increased carbon dioxide concentration in the atmospheric air, or decreased concentration of oxygen increase the toxicity of carbon monoxide so that toxic effects may result more readily from exposure to such concentrations.

Sources of Exposure to Carbon Monoxide.

In accordance with the wide distribution and frequent occurrence of carbon monoxide as the product of incomplete combustion of coal or organic (carbon-containing) materials, such as wood, gasoline, illuminating gas, and many others, the hazards of carbon monoxide exposure exist in many industrial operations and also in our daily lives.

In the *chemical industry* this holds true especially for the manufacturing of illuminating gas, where coke-oven workers and tar distillers appear to be especially exposed; the manufacturing of ammonia gas according to the procedure of Haber and Bosch; the synthetic production of methane and methyl alcohol; and the manufacturing of soda by the LeBlanc process. Charcoal burners and carbide makers may also be exposed to carbon monoxide.

In the *metal industry* the blast-furnace workers, Bessemer-furnace men, and welders may be exposed to carbon monoxide. Carbon monoxide hazards exist also in smelting copper, lead, silver, and zinc, and in brass foundries (chargers, cleaners, coremakers, and cupola men). Blacksmiths, plumbers, and solderers may also be exposed to carbon monoxide.

In the *garment industry* felt blockers and flangers, calico printers, cloth singers, ironers, and pressers may have exposure to carbon monoxide.

In the *ceramic industry* kiln workers and brick burners may be especially exposed but some exposure appears to exist also for teazers, temperers, and moldmakers, enamel makers, and enamelers.

In the *mining industry* the main hazards appear to result from firedamp explosions but the gases of explosives also contain more or less high concentrations of carbon monoxide, so that blasters may have a heavy exposure.

In the *electric industry* carbon monoxide hazards may exist in certain occupations such as cable splicing.

In other trades there is some exposure to carbon monoxide, for example among *lino- and monotypists* from melting pots. *Chimney masons* and *chimney sweepers* may have exposure while repairing and cleaning chimneys if these have not been ventilated.

Carbon monoxide hazards exist also in those *industries which use ovens and stoves* of different types. Here the personnel attending the furnaces, firemen, and boiler cleaners, are especially exposed, but cooks and bakers may also contract carbon monoxide poisoning if their ovens are not properly kept or constructed. Carbon monoxide poisoning has been reported repeatedly in homes from gas heaters and

gas stoves. In this connection it should be pointed out that not only escaping gas but also incomplete combustion may cause carbon monoxide poisoning, as would result for instance from contact of the flame with a cooling surface.

TABLE 1.—*Exposure of workers to carbon monoxide in various industries*

[Number of men exposed out of the total of 136,422 surveyed in Maryland and of 25,122 surveyed in Utah]

Industry	Maryland	Utah
Chemical:		
Fertilizer	52	
Paint and varnish	34	
Petroleum	411	16
Soap	7	
Chemicals, dyes, and insecticides	56	8
Artificial silk	129	
Gas works	74	
All other	71	6
Compressed gases		4
Total	834	34
Clay, glass, and stone:		
Brick and tile	210	4
Glass	125	
Lime, cement, and artificial stone	89	14
Marble and stone	5	6
Asphalt	12	
Others	53	5
Total	494	29
Clothing:		
Hats	89	
Shirts, neckwear, etc	524	
Men's suits, coats, etc	748	8
Women's and children's dresses	199	
Hosiery	4	
Others	104	
Total	1,668	8
Food and allied industries:		
Bakeries	631	69
Dairy products	72	7
Candy	24	33
Fish curing and packing	264	
Flour and grain mills	3	4
Fruit and vegetable canneries	160	13
Ice manufacturing	24	
Slaughter and packing houses	90	4
Liquor and beverage	73	
Sugar factories and refineries		17
Others	115	1
Total	1,456	148
Iron and steel:		
Automobile factories	67	
Automobile repair shops	8	
Blast furnaces and foundries	7,547	456
Car and railroad shops	189	
Ship and boat building	180	
Other iron and steel factories	779	
Others	114	
Total	8,884	456
Metals, other than iron and steel:		
Brass and copper mills	531	253
Gold and silver jewelry factories	15	8
Lead and zinc	37	426
Tin, enamelware, etc	1,035	9
Other metal factories	23	
Total	1,641	696
Leather:		
Shoe factories	6	
Tanneries	9	
Total	15	
Lumber and furniture:		
Furniture factories	8	2
Lumber saw mills and planing	12	
Other woodwork factories	55	
Total	75	2
Paper and printing:		
Blank books, envelopes, paper bags, etc	25	
Paper and pulp mills	65	
Paper-box factories	71	4
Job and newspaper printing	564	7
Total	725	11
Textile:		
Cotton mills	3	
Sail, awning, and tent	34	
Silk mills	4	
Textile dyeing, finishing, and printing mills	8	
Other and not specified textile mills	14	1
Total	63	1
Miscellaneous industries:		
Aircraft	361	
Broom and brush factories	4	
Button factories (buckles)	1	
Dental laboratories		13
Electric light and power plants	660	
Electric machinery and supplies	181	4
Rubber factories	49	1
Mattresses, bedding, etc	5	1
Others	28	2
Total	1,289	21
Transportation industries:		
Steam railroads	1,458	449
Garages, greasing stations, and automobile laundries	113	137
Total	1,571	586
Other trades	15	
Total	15	
Domestic and personal service:		
Laundries	73	[illegible]
Cleaning, dyeing, and pressing	22	
Total	95	6
Extraction of minerals:		
Bituminous coal mines		30
Nonferrous metal mines		953
Nonmetallic mines and quarries		20
Other mineral industries		14
Total		1,017

One source of carbon monoxide exposure which is often not recognized is the use of pressure air lines in safety appliances where the carbon monoxide may originate from the compressor or may be formed by oxidation in dirty air filters.

Cases of carbon monoxide poisoning resulting from *inhalation of exhaust gases* of internal combustion motors represent a very high percentage of all accidents from this gas. Garage workers as well as drivers may have such exposure and suffer from more or less severe carbon monoxide poisoning.

The incidence of potential exposure to carbon monoxide in different industries is illustrated in table 1 which is based on the survey made in different industries in Maryland (*1*) and Utah (*2*), which covered a total of 136,422 and 25,122 workers, respectively, of whom 18,825 and 3,015 had potential exposure to carbon monoxide.

Determination of Carbon Monoxide in Air.

For the determination of carbon monoxide in air, the following general outline is recommended. Samples should be taken wherever there is a known or suspected source of carbon monoxide. Samples should be taken at the breathing level of the workers exposed, special emphasis being given to the locations nearest the source and those in the path of air currents carrying the gas. Such samples should be taken at sufficient intervals of time so that variations of the concentration will be evident. When automatic devices are used, these should be operated continuously during the entire working period; in case single determinations are made, half-hour samples during the working period should be taken. Such samples should be taken in sufficient number to avoid any reasonable doubt of the results found. If only one sampling point is deemed necessary, the samples should be taken in triplicate; in case numerous locations are to be sampled, representative points may be selected among these. The total volume of samples submitted for a single determination should be 125 to 1,000 cc., depending on the concentration of CO. The samples may be collected in vacuum flasks or in transfer flasks by liquid displacement, and they should be transferred to the analytical apparatus by means of water. All methods used for the determination of carbon monoxide should be standardized by the iodine pentoxide technique [2] (*3*). The different analytical methods are discussed in a detailed review by Berger and Schrenk (*20*).

1. *Iodine pentoxide method.*—Carbon monoxide may be determined by means of the iodine pentoxide indicator (Hoolamite), as described by Katz and Bloomfield (*4*). Carbon monoxide produces, with iodine pentoxide in an acid medium, a green color by the formation of an

[2] For further details refer to the Report of the Subcommittee on Chemical Methods of Air Analysis, American Public Health Association Year Book, 1940-41.

unstable substance which may be matched against a set of artificial standards. Unsaturated hydrocarbons, gasoline vapors, hydrogen sulfide, arsine, hydrocyanic acid, and various complex organic compounds will give a similar reaction with this "Hoolamite" reagent unless filtered off by charcoal.

2. *Pyrotannic acid method.*—Other investigators made use of the reaction of carbon monoxide with the hemoglobin of the blood by measuring the amount of carbon monoxide hemoglobin formed, as for instance by the pyrotannic acid method, as described by Sayers, Yant, and Jones (*5*).

3. *Palladous chloride method.*—A semiquantitative method for the detection of carbon monoxide is based on the reduction of palladous chloride with the formation of metallic palladium, as described by Berger and Yant (*6*).

4. *Carbon monoxide recorder.*—Carbon monoxide may also be determined by means of the carbon monoxide recorder and alarm, as described by Katz, Reynolds, Frevert, and Bloomfield (*7*). This is based on the fact that the catalyst "Hopcalite" oxides carbon monoxide with the liberation of heat which can be measured by means of thermocouples and recording potentiometers.

Concentrations of Carbon Monoxide Determined Under Different Conditions.

The following determinations of the amount of carbon monoxide in gases from various sources (*8*) give some information with respect to the concentration of carbon monoxide formed under different conditions.

TABLE 2.—*Concentrations of carbon monoxide found in air under different conditions*

(Sayers and Yant (8))

Type and source:	*Carbon monoxide, volume percent*
Mine explosion, immediately after dust explosion (experimental) as found in mine air	8. 0
Mine explosion, 1 day after explosion in coal mine	1. 0
Mine fire (as found in mine air)	1. 0
Blasting with 40 percent gelatin dynamite, 7 minutes after shooting 100 sticks (as found in mine air)	1. 2
Blasting—products of combustion from black powder	10. 8
Products of combustion of 40 percent nitroglycerin dynamite (gas diluted with air)	28. 0
Products of combustion of 40 percent ammonia dynamite	5. 0
TNT (gases produced, undiluted with air)	60. 0
Blast furnace stack gas (undiluted with air)	28. 0
Bessemer furnace gas (undiluted with air)	25. 0
Crucible furnace; gas fuel, melting Al–Cu–Sn alloy (undiluted with air)	5. 5
Arc furnace melting aluminum (undiluted with air)	32. 2
Cupola gas (undiluted with air)	17. 0
Coke oven gas (undiluted with air)	6. 0

TABLE 2.—*Concentrations of carbon monoxide found in air under different conditions*—Continued

(Sayers and Yant (*8*))

Type and source—Continued.	*Carbon monoxide volume percent*
Coal gas (undiluted with air)	16. 0
Carburetted water gas (undiluted with air)	30. 0
Blue gas, water gas (undiluted with air)	40. 0
Producer's gas from coke (undiluted with air)	25. 0
Producer's gas from oil (undiluted with air)	5. 0
Distillation of coal-oil mixture (undiluted with air)	7. 4
Gas range burning natural gas, improperly constructed and operated appliance (diluted with air)	. 1
Room heater, natural gas, improperly constructed and operated appliance (diluted with air)	. 5
Automobile exhaust gas from exhaust pipe approximately 2 to 12 average	7. 0
City fire (black smoke from burning building)	. 1
Insulation burning in electric arc	. 5
Furnace gas from solid fuel fired small house hot water heating system	1. 0
Railroad locomotive stack gas	2. 0

Carbon monoxide determinations which were made in city streets at peak hours of traffic showed an average concentration of 0.8 parts of carbon monoxide per 10,000 parts of air (*9*) (corresponding to 0.008 percent by volume). Carbon monoxide determinations made in the blood of traffic policemen (*10*), and also other findings (*11*), seem to indicate that with continued exposure there may exist some risk from exposure to carbon monoxide in streets with heavy traffic.

Regarding the concentration of carbon monoxide in the air of garages, an average concentration of 2.1 parts per 10,000 (corresponding to 0.021 percent by volume) was found (*9*). It appears, therefore, that in garages and repair shops dangerous conditions may exist which require special exhaust ventilation and restrictions regarding the time motors are allowed to run in such buildings.

Absorption and Elimination of Carbon Monoxide.

Carbon monoxide is *absorbed* exclusively through the lungs.

The *elimination* of carbon monoxide takes place solely through the lungs by reversal of the process responsible for its absorption; it is not oxidized in the organism (*12*). The rate of elimination of carbon monoxide from the blood depends upon the percentage of oxygen in the air breathed and also upon the type of the respiration. With a carbon monoxide hemoglobin saturation of 40 percent in the blood, the inhalation of pure oxygen causes elimination of carbon monoxide about four times faster, and breathing a mixture of pure oxygen and carbon dioxide (8 to 10 percent) about five to six times faster than when normal air is breathed.

The Determination of Carbon Monoxide in Blood.

The determination of carbon monoxide in blood is very important for proof of existing exposure to carbon monoxide and for the appraisal of the seriousness of the exposure.

The *qualitative* tests for the detection of carbon monoxide hemoglobin are based on its greater stability as compared with that of oxyhemoglobin. Carbon monoxide hemoglobin may be detected by the pyrotannic acid test (*5*, *13*). It may also be detected spectroscopically by its absorption spectrum which shows two absorption bands between the D and E lines which, in opposition to those produced by oxyhemoglobin, persist upon the addition of ammonium sulfide.

There are several methods for the quantitative determination of carbon monoxide in the blood. The pyrotannic acid method (*5*, *13*) is based on the fact that, in the absence of carbon monoxide, pyrotannic acid gives a dirty brown color with blood but in the presence of carbon monoxide hemoglobin, various degrees of pink to red color are developed which may be matched against suitable standards.

Carbon monoxide hemoglobin may be determined by *spectrophotometric* measurements (*14*) and it may be determined *volumetrically* after liberation of the carbon monoxide from its compounds with hemoglobin (*15*, *16*).

Other methods of determining carbon monoxide in blood are based on the reaction of carbon monoxide with iodine pentoxide.

The Relation Between Concentrations of Carbon Monoxide in Air and Toxic Symptoms.

Numerous attempts have been made to determine the minimal toxic or the maximal allowable concentration of carbon monoxide in air. It is generally assumed that concentrations of 0.01 volume percent or 100 parts per million are not harmful. Higher concentrations become rapidly injurious, especially with prolonged exposure, as illustrated in table 3 (*17*).

TABLE 3.—*Physiological response to various concentrations of carbon monoxide*

(Henderson, Haggard, Teague, Prince, Wunderlich (*17*))

	Carbon monoxide, parts per million of air	Volume percent
Concentration allowable for an exposure of several hours	100	0.01.
Concentration which can be inhaled for 1 hour without appreciable effect.	400 to 500	0.04 to 0.05.
Concentration causing just appreciable effects after 1 hour exposure.	600 to 700	0.06 to 0.07.
Concentration causing unpleasant but not dangerous symptoms after 1 hour of exposure.	1,000 to 1,200	0.1 to 0.12.
Dangerous concentration for exposure of 1 hour	1,500 to 2,000	0.15 to 0.2.
Concentrations which are fatal in exposures of less than 1 hour	4,000 and above	0.4 and above.

It was shown that the quantity of carbon monoxide absorbed varies with the amount of physical exercise (*18*). In addition, a reduction of the concentration of oxygen in the air or an increase of the content of carbon dioxide in the air will favor the formation of carbon monoxide hemoglobin and the same physiological effect will be produced by raising the temperature and the humidity of the air.

When an individual is at rest, or with moderate physical exercise, the amount of carbon monoxide hemoglobin formed by exposure to certain concentrations for a definite period of time increases first rapidly and later slowly until an equilibrium between the carbon monoxide in the air and the carbon monoxide hemoglobin is established, as illustrated in table 4 for different concentrations of carbon monoxide in air (*12*).

TABLE 4.—*Equilibria of carbon monoxide with various concentrations of carbon monoxide in the air*

(Sayers and Yant (*12*))

Concentration of carbon monoxide in air (inclusive), volume percent	Percent blood saturation (80 percent approximate equilibrium value)	Time in hours	Concentration of carbon monoxide in air (inclusive), volume percent	Percent blood saturation (80 percent approximate equilibrium value)	Time in hours
0.02-0.03	23-30	5-6	0.16-0.20	61-64	1-1½
0.04-0.06	36-44	4-5	0.20-0.30	64-68	½-¾
0.07-0.10	47-53	3-4	0.30-0.50	68-73	[1] 20-30
0.11-0.15	55-60	1½-3	0.50-1.00	73-76	[1] 2-15

[1] Minutes.

Symptoms of Acute Carbon Monoxide Poisoning.

It has been shown that the primary site of the toxic action of carbon monoxide is the circulatory system but the symptoms and signs from the central and peripheral nervous system are the most conspicuous and show great variation.

1. *From the central nervous system.*—Feeling of fear, headache, vertigo, vomiting, abdominal pain, cough and, later, asphyxial convulsions. Frequently there is a rise of the body temperature which may last for several days. The most characteristic sign in acute carbon monoxide poisoning is the loss of consciousness which may occur quite suddenly and which is usually very deep and persistent so that it takes a comparably long time to recover even under treatment. *Signs of motor irritation* are: Spasms, especially of the upper extremities, trismus, choreatic movements, and, occasionally, convulsions. *Signs of motor depression* have been observed in the form of weakness, especially of the legs. This may sometimes persist after the patient has recovered otherwise and, occasionally, may result in paralysis or paresis. *Sensory disturbances* may consist in headache, pain in the

extremities and in the cardiac region, anesthesias of parts of the body, and neuritides. The response to stimulation of the *reflexes* is very variable and appears to be independent of the severity of the exposure. In deep coma the pupils are sometimes dilated, sometimes constricted, and their reaction to light and accommodation is very inconsistent. *Psychic symptoms* following acute carbon monoxide poisoning may vary in type and intensity. Frequently there is a more or less complete amnesia regarding the time of the exposure. Psychic changes, such as restlessness, irritability, sometimes followed by depression, delusions, disorientation, and, occasionally, dementia, may persist for some time after other symptoms have subsided.

Excretion of sugar and of urobilinogen with the urine indicates a *toxic effect on the metabolism.*

2. *From the circulatory apparatus.*—Lowering of the blood pressure due to vasodilatation and weakening of the heart muscle, or increase of the blood pressure, stasis in the circulatory system, quickening or slowing of the pulse rate and cardiac distress may be observed.

3. *The color of the skin* and especially of the mucous membranes is frequently, but not always, bright red and there may be small hemorrhages, localized edema, vesicles with serous content, and a tendency for decubitus and gangrene.

4. *From the gastrointestinal and urinary tract.*—Nausea, vomiting, diarrhea or constipation, incontinence of urine, and bladder spasms have been reported.

5. Other toxic signs and symptoms observed were: Irregularities of menstruation and *disturbances of the respiratory apparatus.* These may be characterized by an abnormal rate and abnormal sounds, bronchitis appears to be not infrequent, and pulmonary edema and pneumonia may develop on the basis of the disturbed circulation or due to aspiration of vomitus.

The *blood picture* shows, occasionally, in the beginning, a more or less high white blood cell count with a relative increase of the polynuclears, and, in subacute poisoning, an increase of the red blood cells and hemoglobin.

Chronic Carbon Monoxide Poisoning.

There is, at present, considerable controversy as to whether or not there is chronic carbon monoxide poisoning, largely depending on the interpretation of the word "chronic." It appears that continued exposure to moderately toxic concentrations will result in disturbances of the circulation and nervous system.

The Relation Between Exposure to Carbon Monoxide and Toxic Symptoms.

Table 5 shows the relation between the amount of carbon monoxide hemoglobin formed and the toxic symptoms produced (*8*).

TABLE 5.—*Symptoms caused by gradual increase of percentages of carbon monoxide hemoglobin in the blood while individual is at rest or doing moderate exercise*

(Sayers and Yant (8))

Blood saturation in percent of CO hemoglobin:	*Symptoms*
10–20	Tightness across forehead, possibly slight headache, dilatation of cutaneous blood vessels.
20–30	Headache, throbbing in temples.
30–40	Severe headache, weakness, dizziness, dimness of vision, nausea, vomiting, collapse.
40–50	Same as previous item with more possibility of collapse and syncope, increased respiration and pulse.
50–60	Syncope, increased respiration and pulse, coma with intermittent convulsions, Cheyne-Stokes respiration.
60–70	Coma with intermittent convulsions, depressed heart action and respiration, possibly death.
70–80	Weak pulse and slow respiration, respiratory failure, and death.

Mechanism of Carbon Monoxide Poisoning.

Most investigators agree that the toxic effects of carbon monoxide are due to its great affinity for hemoglobin and that it acts mainly by interfering with and finally inhibiting completely the oxygen metabolism.

Effect of Carbon Monoxide on Tolerance.

It appears that some men, frequently exposed to low concentrations of carbon monoxide, may not experience moderate signs of poisoning, such as headache and vertigo.

Measures for the Prevention of Carbon Monoxide Poisoning.

It is obvious that the best prevention of carbon monoxide poisoning would be the prevention of any pollution of the air with carbon monoxide. This can be accomplished to a very high degree by proper engineering methods and adequate ventilation. For continued exposure the concentrations should be kept at or below 100 parts per million by volume (0.01 volume percent). It appears absolutely necessary that the public, and especially those persons who may have occupational exposure to carbon monoxide, be instructed regarding its toxicity and potential dangers. Before entering any space not frequently used and suspected of containing carbon monoxide, air samples should be taken to determine the amount of carbon monoxide present.

Special attention should be paid to safety regulations. It should be kept in mind that carbon monoxide may accumulate in the upper levels of enclosures. Whenever a person must enter a room in which the

presence of carbon monoxide is suspected, he should wear a safety line and an air-supplied respirator or an oxygen respirator while so engaged; he should be watched by a crew of men familiar with the dangers, signs, and symptoms of carbon monoxide poisoning.

It has been stated that the maximal allowable concentration for several hours' exposure is 100 parts of carbon monoxide per million parts of air, or 0.01 percent by volume, and it has been shown that 400 to 500 parts per million, or 0.04 to 0.05 percent, can be inhaled for 1 hour without appreciable effects. It should be emphasized, however, that, with concentrations greater than 100 parts per million, increased humidity, increased carbon dioxide concentration in the air, and decreased concentration of oxygen tend to increase the toxicity of carbon monoxide, so that toxic effects may result more readily from exposure to concentrations above the maximal allowable limit. Under certain conditions the appraisal of the carbon monoxide hazard may, therefore, also require the determination of the carbon dioxide and oxygen content and the humidity of the air.

In view of the toxic effects of carbon monoxide on the circulatory and nervous systems a proper choice of personnel is also of considerable importance. Any person suffering from serious diseases of the vascular system, nervous disorders, or extensive affections of the lungs should be excluded from operations in which the danger of exposure to carbon monoxide may exist.

Serious sequelae of carbon monoxide poisoning may be prevented by adequate medical supervision. If there is the slightest indication of exposure to carbon monoxide, the blood should be tested for carbon monoxide hemoglobin so that the prodromal stage of the poisoning may be detected and treated properly. The enforcement of such regulations prevents claims attributing pathologic conditions from other causes to carbon monoxide exposure.

The Treatment of Carbon Monoxide Poisoning.

This should always be carried out by a qualified physician, although first aid (Nos. 1, 2, and 3) must be given pending his arrival. In summarizing experience with the treatment of carbon monoxide poisoning, the procedure outlined by R. R. Sayers (*19*) is recommended. It is as follows:

1. The victim should be removed to fresh air as soon as possible.

2. If breathing has stopped, is weak and intermittent, or present in but occasional gasps, artificial respiration by the Shaefer method should be given persistently until normal breathing is resumed or until after the heart has stopped.

3. Pure oxygen or a mixture of 5 percent carbon dioxide and 95 percent oxygen should be administered using an inhaler, beginning as soon as possible and continuing for at least 20 minutes in mild cases and as long as 3 hours if necessary in severe cases if the patient does not regain consciousness. The administration of oxygen or of the mixture of carbon dioxide and oxygen when given immediately

will greatly lessen the number and severity of the symptoms from carbon monoxide poisoning and will decrease the possibility of serious aftereffects.

4. Circulation should be aided by rubbing the extremities of the patient and keeping the body warm with blankets, hot-water bottles, hot bricks, or other devices, care being taken that these objects have been wrapped or do not come into contact with the body and cause burns.

5. The patient should be kept at rest, lying down to avoid any strain on the heart. Later he should be treated as a convalescent and should be given plenty of time to rest and recuperate. Exercise was at one time recommended; however, the procedure is hazardous, as the patient quite often loses consciousness, and in some cases death occurs.

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(Publications marked with an asterisk (*) may be obtained from the U. S. Public Health Service, Washington, D. C.; those preceded by two asterisks (**) may be obtained from the U. S. Bureau of Mines, Washington, D. C.; those marked with a dagger (†) may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C.; and the sign ‡ indicates that the publication is out of print. It is believed that most of the other publications may be consulted at local medical or technical libraries, or access to them may be secured through State health departments.)

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FINANCIAL SUPPORT OF HOSPITALS CONTROLLED BY STATE AND LOCAL GOVERNMENTS [1]

By Elliott H. Pennell, *Statistician*, Joseph W. Mountin, *Senior Surgeon*, and Kay Pearson, *United States Public Health Service*

This article, one in the series reporting the findings of the Federal Business Census of Hospitals,[2] is limited to an analysis of the financial plans of only those hospitals which are controlled by State and local governments. An early article [3] has already covered in some detail the financial support of nongovernmental or voluntary hospitals. The study of voluntary institutions treats such topics as the completeness of the coverage of the Census, total hospital income and income per bed, expenditure per unit of income, and proportions of revenue derived from particular sources. Since the earlier article was more or less preliminary in nature and since in many instances the financial structure of nongovernmental and of governmental hospitals is

[1] From the Division of Public Health Methods, National Institute of Health. Study conducted in connection with the National Health Inventory, assistance in the preparation of these materials having been furnished by the personnel of Work Projects Administration Official Project Number 712159-658/9099.

[2] Previous articles based on the 1935 Business Census of Hospitals conducted by the United States Public Health Service are:

Pennell, Elliott H., and Mountin, Joseph W.: The financial support of non-government hospitals as revealed by the recent Federal Business Census of Hospitals. Hospitals, Vol. 11, No. 12, December 1937.

Mountin, Joseph W., Pennell, Elliott H., and Hankla, Emily: A study of the variations in reports on hospital facilities and their use. Public Health Reports, Vol. 53, No. 1, January 7, 1938.

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fundamentally different, little attempt has been made here to parallel the analysis followed in the other report.

Certain points of difference between the two articles should, however, be made clear. The present study treats only governmental hospitals, exclusive of the Federal, which are registered by the American Medical Association;[4] the other study embraces both registered and nonregistered voluntary hospitals which supplied information during the Census. Totals presented here are estimates obtained by projecting figures submitted by registered hospitals to such level that they represent aggregate registered hospitals; the sums presented in the earlier analysis are reported figures. This study is confined to general and allied special[5] hospitals; the preceding one includes mental and tuberculosis hospitals as well. Numerically, the general and special hospitals under the control of State and local governments are in most instances better adapted to statistical treatment; and, in particular, they appear more responsive to environmental forces. This responsiveness may be attributed in part to the fact that they receive more of their support directly from patients than do the governmental hospitals devoted solely to the care of mental and tuberculosis cases, and thus are more closely allied with the economic status of inhabitants of the area.

As this is in principle a survey of governmental hospital facilities available to the general population, the Federal hospitals do not provide a sufficient volume of community service to warrant inclusion here. Also it should be made clear that these data as well as those published in other reports of the Census do not include figures for infirmary units of institutions such as prisons, homes for the aged, and colleges, many of which are maintained by governments. Because of the subsidiary nature of such hospital departments, they do not readily lend themselves to comparison with hospitals that exist independently. Then, too, financial reports do not as a rule separate the accounts of the infirmary units from those of the foster institutions.

Hospitals selected for analysis are divided on the basis of control into two groups—those subject to State governments and those subject to local governments. For each of the groups, subdivided by geographic location of the hospital, are presented income per bed and percentage of income from patients, taxes, and miscellaneous sources.[6]

[4] Journal of the American Medical Association, Vol. 106, No. 10, March 7, 1936.

[5] "Special" hospitals, as used here, are hospitals furnishing types of care which are closely identified with general medical and surgical service. These hospitals include maternity, industrial, isolation, eye-ear-nose-throat, orthopedic, children's, and others offering similar specialized types of care. Mental and tuberculosis hospitals are not included.

[6] Only hospital income used for current operation is considered. Under the heading "patients" are included all receipts from persons who are given either bed or ambulatory care. Usual allotments as well as emergency appropriations from public revenue represent "taxes." Such sums as earnings from investments and donations from charitable orders are comprised in the classification "other."

Data covering the same items are likewise furnished for each control group subdivided according to the bed capacity of the institution.

The two summary investigations just described, namely, an inquiry regarding sources of income for each control group classified first by geographic locality and second by bed capacity, are followed by a more detailed investigation which is the nucleus of the study. It is devoted only to those general and special hospitals that are operated by county and city governments, singly or in association. Amount of income and its derivation remain the foci of the investigation. Inasmuch as there is no apparent demarcation between county and city hospitals in regard to their location and mode of operation, they are treated in the aggregate.

As has already been stated, financial figures presented herein are estimates covering all registered hospitals of specified type in the United States. The first step in preparing the estimates was to determine how many of the total beds in registered hospitals were covered by the schedules submitted during the Census. Returns from hospitals operated by State and local governments proved to be especially satisfactory in compass, representing 90 percent of the aggregate beds in such institutions. Use of this base made possible the computation of totals that describe rather accurately, it is believed, the financial support of all registered governmental hospitals.

In only limited measure have governmental agencies of the continental United States participated in the provision of general and allied special hospitals. Not more than one-eighth of the entire number classified as general and special are owned by State and local governments. However, the supply of beds in the hospitals so owned amounts to practically one-fourth of the total capacity, an indication of the exceptional size of governmental hospitals. Large capacity is especially typical of State operated hospitals, which average twice as many beds as do those provided by local governments. Among local agencies, city governments surpass those of counties both in number of institutions and in number of beds which they supply for general and allied special services.

Diversity in geographic and economic features of various sections of the country invites question as to how peculiarities of each area are reflected in the distribution of hospitals and in their means for support. Throughout the series of reports on the Business Census of Hospitals, the forty-eight States and the District of Columbia have, for comparative purposes, been divided into four areas designated as Northeastern, Southern, Central, and Western.[7] The Northeastern is,

[7] The estimated population of each area as of July 1, 1935, and the States included in each are as follows: *Northeastern* (38,261,000): Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia.

Southern (37,576,000): Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

of course, densely settled, industrial, and relatively wealthy. The Southern, with agriculture as the main pursuit, stands almost in direct contrast. Central States, next to those of the South in point of per capita income, combine the industry of the Northeast and the agriculture of the South, leaning in general toward the latter. Western States, rather dissimilar among themselves, rank close to the Northeastern area in per capita income.

In figure 1 is shown, by geographic area, the income pattern for hospitals provided by State and by local governments. Before income is examined as to source, brief consideration may be given the

CONTROL AND LOCATION OF HOSPITAL	NUMBER OF HOSPITALS	NUMBER OF HOSPITAL BEDS	INCOME PER BED
STATE GOVERNMENTS			
NORTHEASTERN	22	7,756	$1,081
SOUTHERN	15	4,337	613
CENTRAL	15	5,739	1,284
WESTERN	6	747	1,780
LOCAL GOVERNMENTS			
NORTHEASTERN	107	33,644	872
SOUTHERN	120	11,200	721
CENTRAL	196	23,224	770
WESTERN	88	16,622	866

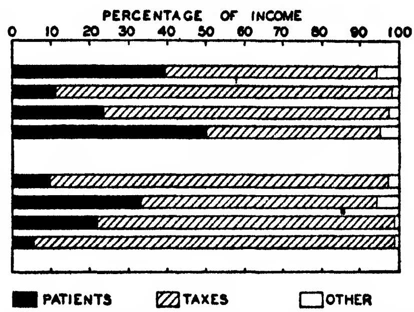

FIGURE 1.—Estimated income per bed and percentage from specified source for registered general and special hospitals under State and local governmental control, by location of hospital.

proportionate income of the several classes of hospitals. Income per bed, which serves as an adequate measure for comparison, may also be considered as cost per bed, in view of the fact that hospital income is taken here to be identical in amount to operating expense. Some explanation should be given, however, regarding the limitations of the measure adopted. Between total income for hospitals accepting fees from patients and number of beds occupied, there is of course direct relationship, poor occupancy naturally resulting in low average income. Governments with small budgets may demand that their hospitals limit both the expensiveness and the variety of the services afforded, thus keeping low the allotments necessary. Governments in wealthy areas may encourage expansion in specialized and expensive treatment, thereby increasing average costs per bed. Always present is inequality in price levels from area to area, a factor that enters into the costs of supplies and of personnel service which the hospital must procure, hence into the scale of fees charged patients and into the size of the appropriation required from the sponsoring agency. Such conditions as these, which are in some measure conducive to variation,

Central (39,300,000): Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

Western (12,384,000): Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.

should be taken into account at any time that comparisons of total revenue are made.

State controlled hospitals are, according to the statistics shown in figure 1, operated much less expensively in the South than in any other area. This is the only section in which such hospitals are maintained at a cost of less than $1,000 per bed. In fact, the income per bed, $613, is only three-fifths as large as that for the next lowest area, the Northeast. The position of the Northeast is somewhat unusual, as heretofore investigations[8] have shown rather consistently that operating costs as reflected by expenditures are higher in the Northeastern area than in any other. State hospitals in the Central region rank second highest in average income per bed. Most expensive in operation, the few relatively small institutions owned by States in the Western section receive per bed an amount almost three times that provided in Southern States.

Hospitals under the supervision of city or county governments do not receive as liberal incomes in relation to bed capacity as do those under State management. Figures not supplied in the chart show that the difference in the averages for the two control groups exceeds $200 per bed. Within each separate area except the South receipts per bed for State hospitals decidedly overtop those for hospitals under local sponsorship. In the South, upkeep of city and county hospitals consumes more than $100 per bed beyond the sum devoted to State institutions. If the four geographic areas are ranked according to income per bed received by local governmental hospitals, the Northeastern stands highest, the Southern lowest, the Western in upper intermediate position, and the Central in lower intermediate position. The uniformity of the figures showing income per bed for local governmental hospitals in the several areas is in striking contrast with the wide deviation revealed by State hospitals of different location.

The proportion of income which State-controlled general and special hospitals derive from fees paid directly by patients is of singular interest. The sums so derived run as high as 50 percent of the total income for hospitals of the West and 40 percent for those of the Northeast. In Central States the percentage drops to about 25, and in Southern States to 10. It happens that a fairly high proportion of the general hospitals owned by States are teaching hospitals affiliated with State universities. Having a stated fee schedule,[9] these hospitals obtain considerable revenue from patients who are perhaps attracted by the availability of special techniques in the teaching hospitals. In some instances, State hospitals not affiliated with medical schools also

[8] Pennell, Elliott H., Mountin, Joseph W., and Pearson, Kay: Business Census of Hospitals, 1935. General report. Supplement No. 154 to the Public Health Reports. United States Government Printing Office, 1939.

[9] Fifield: American and Canadian Hospitals, 1937. Midwest Publishers' Company, Minneapolis.

levy nominal fees on those who can pay, often adjusting the rates according to the individual's financial ability. It may be that occasionally remittances by county or city governments to State hospitals for service to indigents of the local jurisdictions are recorded by the hospital as received from the patient rather than from tax funds. These facts taken together undoubtedly account in large part for the high degree of patient support existing in some areas.

Only in Southern and Central regions is income for State hospitals obtained almost entirely from tax funds, the respective percentages being 87 and 74. The other two geographic divisions range around 50 percent in proportion of hospital income which is obtained from public sources. The relative amounts received by governmental hospitals

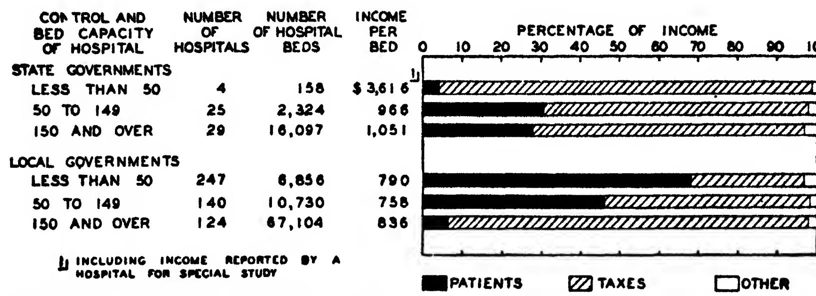

FIGURE 2.—Estimated income per bed and percentage from specified source for registered general and special hospitals under State and local governmental control, by bed capacity of hospital.

from "other" sources are, as a rule, so trivial a fraction of the total that in this analysis they are seldom given particular mention.

Hospitals provided by county and city governments, like those controlled by State governments, are not fully tax-supported. In Southern States as much as one-third and in Central States more than one-fifth of the revenue originates from patients. These, it will be recalled, are the two areas in which the smallest proportions of the income for State hospitals are reported as derived directly from patients. Oddly, between State and local governmental hospitals in each of the geographic areas there happens to be complete inversion in the rank of the percentages of income secured from patients, and, concomitantly, in the order of those showing income from taxes.

To what extent is the size of a hospital associated with particular financial patterns? Data bearing on this question are furnished in figure 2, which presents on the basis of bed capacity the same data that were submitted on the basis of geographic area in figure 1. For convenience of discussion, general and special hospitals are divided into three size categories: small (less than 50 beds), medium (50 to 149 beds), and large (150 beds and over).

It is doubtful that changes in bed capacity classification show any consistent relation to fluctuations in average income per bed. If the

small hospitals of State ownership, which appear to be atypical as a result of the presence among them of a hospital devoted to research, are excluded, the remaining groups do not show notable deviation. Income per bed, it may be pointed out, is greater for State hospitals of each bed capacity interval than for city and county hospitals of corresponding size.

As to source of income, some differences occur among State hospitals of diverse capacities; pronounced variation is apparent among the several size categories of hospitals subject to city or county governments. Again, the direction of the changes is apparently diametric

LOCATION AND BED CAPACITY OF HOSPITAL	NUMBER OF HOSPITALS	NUMBER OF HOSPITAL BEDS	INCOME PER BED
NORTHEASTERN			
LESS THAN 50	33	981	$ 935
50 TO 149	27	2,141	947
150 AND OVER	47	30,522	864
SOUTHERN			
LESS THAN 50	53	1,412	606
50 TO 149	43	3,253	652
150 AND OVER	24	6,535	781
CENTRAL			
LESS THAN 50	131	3,684	845
50 TO 149	38	2,779	895
150 AND OVER	27	16,761	732
WESTERN			
LESS THAN 50	30	779	683
50 TO 149	32	2,557	584
150 AND OVER	26	13,286	931

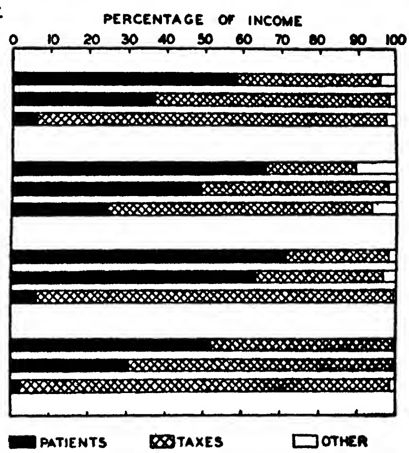

FIGURE 3.—Estimated income per bed and percentage from specified source for registered general and special hospitals under local governmental control, by location and bed capacity of hospital.

for the two control groups. Both medium and large State hospitals receive more income from patients and miscellaneous sources and correspondingly less from taxes than do small institutions. In fact, the few State-owned hospitals of small capacity are almost wholly tax-supported. Among local hospitals of official control, the proportion of income from patients sinks from 68 percent for small hospitals to 7 percent for large ones; at the same time the percentage from public funds rises sharply from 29 for small hospitals to 91 for the large. In other words, small city and county hospitals are supported chiefly by fees from patients and large ones almost wholly by tax funds.

The remainder of the analysis is restricted to general and special hospitals which are controlled by local governments. In figure 3 may be seen again the lack of association between size and amount of income per bed. Neither within a given geographic area nor among the corresponding size categories of hospitals in the several areas is there any indication of correlation between size and per bed income received by hospitals under the supervision of local governments.

As explained earlier, so many factors may alter amount of income that no one of them can well be identified as ascendant.

Striking parallelism in pattern of income by source characterizes each area, as is shown in figure 3. When bed capacity increases, percentage of income from patients decreases; and this decline is, in turn, offset by a corresponding rise in percentage of income from taxes. Briefly, the relation between size of hospital and proportion of income from patients is inverse; between size and proportion from taxes, direct. The percentage of income from patients and percentage from taxes are essentially complementary; the remainder of the revenue, that from miscellaneous sources, is too small to exert appreciable effect.

To all appearances, small governmental hospitals locally controlled are supported in much the same manner as are voluntary hospitals. In some instances the same thing may be said for those of medium size. For example, small hospitals in Central States obtain practically three-fourths of their receipts from patients and medium sized ones get almost two-thirds through the same channel. In sharp contrast, large hospitals so located secure but 6 percent of their revenue directly from patients. For each area the course is repeated on a slightly different plane. Small and medium sized hospitals in Southern States derive from fees of patients two-thirds and one-half of their income, respectively. Large hospitals of this area constitute an exception, in that one-fourth of their support originates from patients—a fraction that is markedly higher than it is for large hospitals in any other region. Systems of support for hospitals of the Northeast and those of the West are of much the same mold. In each section hospitals with less than 50 beds rely on patients for something more than one-half of their upkeep and those with 50 to 149 beds rely on such source for approximately one-third. The large ones are practically independent of charges to patients, the Western group in particular as only 3 percent of their support is thus derived. For emphasis of the resemblance between voluntary hospitals and small governmental hospitals under local agencies, attention may be called to the fact that governmental institutions of low bed capacity in both Southern and Central States are but one-fourth tax-supported.

In each geographic area, with its particular economic characteristics, bed capacity of hospitals has been proved to be highly correlated with scheme of financial support. Within these areas is it possible that the population of the county may also be instrumental in shaping the financial pattern of hospitals? There are reasons for expecting an affirmative answer, the chief reason being that between size of hospital and population of county there is some degree of interrelationship. In general, small hospitals are indigenous to localities of limited population; large ones to more populous areas. For a graphic pres-

entation of the influence of various ranges of population, figure 4 has been prepared. Counties have been assembled into three population classes, small, medium, and large, with 40,000 and 100,000 as the points of division.

Again the matter of income per bed may be dismissed with the statement that apparently county population is not associated with income per bed received by hospitals. As to source of income, a rather definite trend is evident among the population brackets established for the analysis. Broadly speaking, hospitals in counties with less than 100,000 population receive the greater part of their support from patients, and those in large counties secure practically all of their revenue from taxes. Figures descriptive of Northeastern,

LOCATION OF HOSPITAL AND POPULATION OF COUNTY	NUMBER OF HOSPITALS	NUMBER OF HOSPITAL BEDS	INCOME PER BED
NORTHEASTERN			
LESS THAN 40,000	13	507	$1,016
40,000 TO 99,999	11	444	584
100,000 AND OVER	83	32,693	873
SOUTHERN			
LESS THAN 40,000	50	1,737	568
40,000 TO 99,999	39	3,358	677
100,000 AND OVER	31	6,105	789
CENTRAL			
LESS THAN 40,000	105	3,260	793
40,000 TO 99,999	34	1,906	870
100,000 AND OVER	57	18,058	755
WESTERN			
LESS THAN 40,000	49	2,614	636
40,000 TO 99,999	17	2,680	650
100,000 AND OVER	22	11,328	970

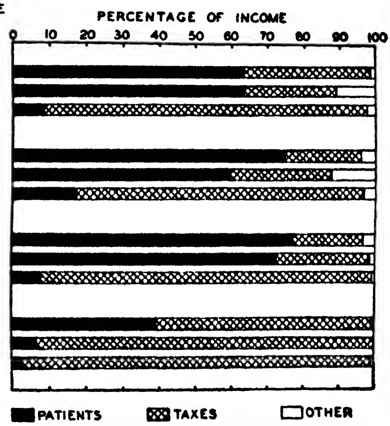

FIGURE 4.—Estimated income per bed and percentage from specified source for registered general and special hospitals under local governmental control, by location of hospital and population of county wherein it is situated.

Southern, and Central States substantiate this statement. The Northeastern area may be cited as typical. There, close to two-thirds of the income for hospitals in counties of small and intermediate population classes is acquired through the medium of patients, while nine-tenths of the income for hospitals in counties of the large class comes through government appropriation. Hospitals in the Western section fail to conform entirely with the financial patterns of those in other areas. Although reduction in the percentage of income from patients accompanies an increase in population, it is only hospitals in small counties of the West that collect a considerable fraction of their income from patients. Hospitals in counties of the two upper population classes obtain well over 90 percent of their revenue from taxes. Of interest is the fact that in both the Northeast and the South hospitals located in counties of intermediate population range secure slightly more than one-tenth of their receipts from miscellaneous sources.

From the foregoing analysis, it is obvious that a far larger fraction of the services of governmental hospitals in counties of large population is available for low income patients than in those of small population, if the proportion of income from taxes is used as an index of the amount of free treatment afforded. Between metropolitan and nonmetropolitan counties in each area, there is likewise a decided difference in the sums contributed from taxes. Figure 5 demonstrates the inequality. In this figure, counties containing hospitals are divided into two groups, those that are metropolitan and first tier and those that are second tier and beyond. According to the classification used here, the metropolitan character of a county is determined by its location in relation to a metropolitan district as defined by the Bureau of the Census.[10] Any county in which more

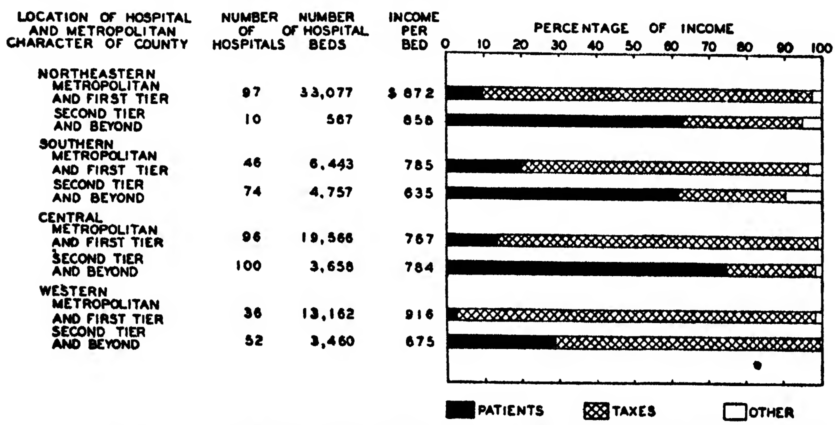

FIGURE 5.—Estimated income per bed and percentage from specified source for registered general and special hospitals under local governmental control, by location of hospital and metropolitan character of county wherein it is situated.

than half of the population resides within the limits of these established metropolitan districts is considered metropolitan. Counties adjoining those which are of metropolitan classification are designated as first tier; all others are described as second tier and beyond.

It is recognized that the two factors, metropolitan character and population of county, are to some extent interwoven. Populous counties are likely to be metropolitan in character, while those with few inhabitants are likely to be remote from population centers. In each area except the Central, the income per bed is higher for hospitals located in metropolitan and first tier counties than for those in other counties. The two figures for institutions in Central States are rather close. Clear-cut distinctions describe sources of income for hospitals located in counties of different metropolitan character. In no in-

[10] Metropolitan Districts—Population and Area. Fifteenth Census of the United States, 1930, Bureau of the Census, United States Department of Commerce.

stance among hospitals in metropolitan and first tier counties does the portion of income from patients exceed 20 percent. At the same time, in no area, exclusive of the Western, does the percentage so derived fall below 60 for hospitals in counties two or more tiers from metropolitan centers. Equally striking, of course, are the variations in the percentage of income from governments. Hospitals in metropolitan and first tier counties are almost wholly tax-supported, percentages ranging from 76 for the South to 96 for the West. Not more than one-third of the income for hospitals in nonmetropolitan or rural counties results from taxation except in the West where nearly all income is tax-derived, regardless of the characteristics of the hospital locality.

As a concluding investigation of the means of support for general and special hospitals, bed capacity of the hospital in conjunction with

POPULATION OF COUNTY AND BED CAPACITY OF HOSPITAL	NUMBER OF HOSPITALS	NUMBER OF HOSPITAL BEDS	INCOME PER BED
LESS THAN 40,000 POPULATION			
LESS THAN 50 BEDS	166	4,385	$ 746
50 TO 149 BEDS	49	3,339	690
150 BEDS AND OVER	2	394	452
40,000 TO 99,999 POPULATION			
LESS THAN 50 BEDS	47	1,421	843
50 TO 149 BEDS	39	3,158	671
150 BEDS AND OVER	15	3,809	687
100,000 TO 249,999 POPULATION			
LESS THAN 50 BEDS	17	527	586
50 TO 149 BEDS	31	2,484	756
150 BEDS AND OVER	29	8,660	711
250,000 POPULATION AND OVER			
LESS THAN 50 BEDS	17	523	1,231
50 TO 149 BEDS	21	1,749	1,047
150 BEDS AND OVER	78	54,241	870

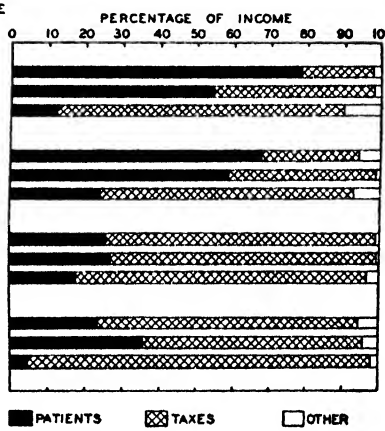

FIGURE 6.—Estimated income per bed and percentage from specified source for registered general and special hospitals under local governmental control, by population of county wherein the hospital is situated and bed capacity of hospital.

population of the county is examined. In order that the weight of county population in altering amount of income from a particular source may be more fully appreciated, the group of counties earlier designated as large is divided into two classes which will hereafter be described as large (100,000 to 249,999) and very large (250,000 and over). Average income per bed for hospitals in counties of each of the population classes under 250,000 is not widely different; for the class of 250,000 and over it is considerably higher. Inspection of figure 6 shows that among the bed capacity groups of each population bracket, changes in amounts per bed are not so ordered that positive trends may be discovered.

Sources of income again prove to be closely allied with county population. Averages not supplied in figure 6 emphasize the modifi-

cation of financial structure that is concurrent with change in population. For aggregate hospitals in counties of low population the percentage of income from patients is 66; it falls to 45 for hospitals in counties of medium-sized population range, to 20 for the large, and to 6 for the very large. Percentage of income from public funds ascends with about the same acceleration that percentage from patients descends, beginning with 32 and ending with 92. In the first two population categories, the proportion of income which hospitals draw from patients steadily falls as the size of the hospital grows. In general, a similar shift occurs in regard to the income for hospitals located in counties of the two upper population brackets; however, the highest proportion from patients is obtained not by small but by medium-sized hospitals. Extremes in the proportions of income furnished by patients are interesting—78 percent for small hospitals in counties with less than 40,000 population and 5 percent for large hospitals in counties with 250,000 or more inhabitants. All in all, when size of hospital in conjunction with size of county forms the basis for analysis, findings regarding schemes of support are in close accord with those resulting from the preceding investigations.

SUMMARY

Knowledge of existing possibilities for hospitalization is needed if plans for extension of hospital service are to be successful. Since the matter of availability goes much deeper than the mere presence of facilities, it has been the purpose of this report and of others in the series to analyze the means of support for various groups of hospitals and thus to reflect in some measure the opportunity which persons with little or no income have of securing hospitalization, unless given aid. Fiscal data for the several studies were afforded by the Business Census of Hospitals conducted during 1935 by the United States Public Health Service.

This report has covered governmental hospitals, exclusive of the Federal, which offer general or closely allied medical or surgical service. As it is concerned primarily with community facilities and their means of operation, State hospitals, which are not definitely a part of the community containing them, have been given brief treatment. Composed to a considerable extent of teaching hospitals associated with universities and of other hospitals which customarily collect fees directly from persons receiving care, they report a sizable fraction of their income from patients, especially if the hospitals are located in Northeastern and Western States. Only in Southern and Central States is the amount of support obtained from taxes sufficient to enable State hospitals to devote most of their service to persons in the low-income brackets.

Operating expense, which may in the case of governmental hospitals be measured by receipts per bed, proves to be lower by an average of some $200 for hospitals controlled by local governments than for those controlled by State governments. The proportion of their income which city and county hospitals receive from patients amounts to but one-seventh of the aggregate revenue; however, among locally controlled institutions of different size and of different location, sources of income are widely divergent.

Throughout each geographic area, county and city hospitals with a bed capacity of less than 50 derive considerably more than half of their income from direct payments by patients. Also, throughout all sections except the Western, hospitals located in counties of less than 100,000 population receive from three-fifths to three-fourths of their income from individual fees. Likewise all hospitals in nonmetropolitan counties secure similar fractions of their revenue from individual fees. Probably the most striking finding of the study is that local governmental hospitals with less than 50 beds, located in counties of less than 40,000 population, obtain from patients 78 percent of their entire receipts.

Evidently, then, many of the publicly controlled hospitals are operated from a financial viewpoint in much the same manner as are privately owned ones. Small hospitals, those situated in counties with few inhabitants, and those in counties distant from population centers draw from patients practically the same proportion of their income as do nonprofit hospitals. Disclosure of this interrelationship between characteristics of the community and means of financial support for governmental hospitals serves to highlight existing inequalities in opportunity for hospitalization.

QUALIFICATIONS OF PROFESSIONAL PUBLIC HEALTH PERSONNEL [1]

V. LABORATORY WORKERS

By Mayhew Derryberry, *Senior Health Education Analyst*, and George Caswell, *United States Public Health Service*

Laboratory service is the one essential public health function that has, in general, remained centralized and under the control of State health departments. Although laboratories may be found operating

[1] From the Division of Public Health Methods, National Institute of Health. This is the fifth in the series: Qualifications of Professional Public Health Personnel. The preceding papers are: I. Plan and Scope of the Survey, II. Health Officers and Other Medical Personnel, III. Nurses, and IV. Sanitation Personnel. The coverage, limitations, and methods of the survey have been fully discussed in the earlier papers, especially the first.

This survey was made possible through the cooperation of State and local health officers and members of their staffs throughout the country. Acknowledgment is also made of the extensive clerical assistance provided by the Works Progress Administration, Project No. 765-23-3-2. Data collected in 1938.

in conjunction with local departments, they are frequently branches of the State organization. Only a few cities and other jurisdictions operate laboratories independently, since the facilities in a given department can and do serve relatively extensive geographic areas. For these reasons, the workers concerned are not only mainly under State control but also numerically the smallest of the major professional groups in public health.

Out of 16,670 schedules submitted in the general survey of the qualifications of public health personnel, only 1,291 (fewer than 8 percent) came from professional laboratory workers of all classes. Because of the centralized character of laboratory service, no attempt has been made to maintain jurisdictional distinctions in the present analysis, but rather the 1,291 workers have been classified only by function. There are 124 laboratory directors, 703 expert technicians (bacteriologists, chemists, and toxicologists), and 464 assistants (including laboratory technicians). No schedules were requested from semiskilled and unskilled personnel such as laboratory helpers and laborers. In contrast to the other professional groups in public health, laboratory workers are about equally divided between the sexes, with a ratio of 12 men to 13 women. In table 1 it will be seen that the great majority of directors and over half the expert technicians are men, but two out of three assistants are women. All but 3 percent of the group as a whole are white.

TABLE 1.—*Laboratory workers by professional classification, sex, and color*

Professional classification	All laboratory workers	Sex and color			
		Male		Female	
		White	All other	White	All other
	Number				
All classes	1,291	592	28	655	16
Directors of laboratories	124	89	3	31	1
Expert technicians	703	353	16	325	9
Laboratory assistants	464	150	9	299	6
	Percentage				
All classes	100.0	45.9	2.2	50.7	1.2
Directors of laboratories	100.0	71.8	2.4	25.0	.8
Expert technicians	100.0	50.2	2.3	46.2	1.3
Laboratory assistants	100.0	32.3	1.9	64.5	1.3

Age.—Laboratory workers are, on the average, the youngest of the major professional groups in public health. With an average age of 36.5 years, they are 2.5 years younger than the public health nurses,

whom they resemble in age distribution. Laboratory directors average 44 years of age, 6.5 years older than the expert technicians and 11 years older than assistants (see table 2). It might be pointed out that almost half of the assistants are under 30; but 3 out of 4 expert technicians and 24 out of 25 directors are 30 or over. These differences are to be expected in view of the extensive experience commonly required for the more responsible positions.

TABLE 2.—*Age of laboratory workers*

Age (years)	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All ages	1,291	100.0	124	100.0	703	100.0	464	100.0
Under 25	137	10.6			46	6.5	91	19.6
25-29	274	21.2	5	4.0	135	19.2	134	28.9
30-34	265	20.5	17	13.7	166	23.6	82	17.7
35-39	185	14.3	23	18.5	101	14.4	61	13.1
40-44	153	11.9	26	21.0	91	13.0	36	7.8
45-49	113	8.8	19	15.3	67	9.5	27	5.8
50-54	78	6.1	20	16.1	43	6.1	15	3.2
55-59	40	3.1	7	5.7	21	3.0	12	2.6
60 and over	34	2.6	7	5.7	22	3.1	5	1.1
Unknown	12	.9			11	1.6	1	.2
Average	36.5		44.1		37.4		33.1	

EDUCATIONAL QUALIFICATIONS

Basic training.—Laboratory personnel as a whole appear basically well trained for their positions. Previous studies have pointed to the fact that, in contrast to other classes of public health personnel, qualified laboratory workers have consistently been available.[2] Fewer than 15 percent of the present employees (mostly laboratory assistants) do not report college training. Only 5 directors and 58 expert technicians do not report some college training. In table 3, showing levels of training for the several groups, it will be noted that two-thirds of all the workers have college degrees and nearly one-quarter have had some graduate work. Academic and professional degrees held are shown at the foot of the table. In tabulating the degrees, no attempt has been made to determine the number of workers having two academic degrees, or both an academic and a professional degree, as opposed to those having only a single degree. Hence, the total number of degrees reported is considerably greater than the number of individuals with college and graduate work.

[2] The White House Conference in 1930 reported that the securing of qualified laboratory workers presented no serious administrative difficulty. (Public Health Organization, vol. IIA, Reports of the White House Conference on Child Health and Protection. The Century Company, New York, 1932, p. 265.)

TABLE 3.—*Level of academic and professional training reported by laboratory workers*

Level of training reported	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,291	100.0	124	100.0	703	100.0	464	100.0
Less than high school	35	2.7	2	1.6	10	1.4	23	5.0
High school, no college [1]	145	11.3	3	2.4	48	6.8	94	20 2
College, no degree	244	18.9	12	9.7	100	14.2	132	28.4
College degree	567	43.9	61	49.2	347	49.4	159	34.3
Graduate work	300	23.2	46	37.1	198	28.2	56	12.1
Number with academic degrees	791	61.3	89	71.8	495	70.4	207	44.6
Number with professional degrees	139	10.8	38	30.6	87	12.4	14	3.0
Number with graduate degrees	181	14 0	35	28.2	120	17.1	26	5.6

[1] Includes those who made no report on training beyond high school.

A distribution of the specific degrees held by the various types of workers appears in table 4. There are more doctors of philosophy and science among this small group of laboratory workers than among any of the other larger groups of professional public health personnel. In addition, there are 51 doctors of medicine, two-fifths of whom are in charge of laboratories. Among the three functional classes, the directors report relatively the largest number of degrees of all types, although almost as great a proportion of expert technicians as of directors report undergraduate degrees. In comparison with the other two laboratory groups, the assistants have relatively few graduate academic degrees, but even so, they have relatively more such degrees than do either nurses or sanitation workers.

TABLE 4.—*Degrees held by laboratory workers, by type of degree and class of worker*

Degrees held	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total persons	1,291	100.0	124	100.0	703	100.0	464	100.0
Total with degrees	867	67.1	107	86.3	545	77.5	215	46.3
Undergraduate academic	796	61.6	89	71.8	500	71.1	207	44.6
Bachelor of arts	340	26.3	40	32.3	213	30.3	87	18.8
Bachelor of science	411	31.8	45	36.3	256	36.4	110	23.7
All other	45	3.5	4	3.2	31	4.4	10	2.1
Graduate academic	229	17.7	46	37.1	156	22.2	27	5.8
Master's (arts or science)	183	14.2	35	28.2	122	17.4	26	5.6
Doctor of philosophy [1]	42	3.2	9	7.3	32	4.5	1	.2
Doctor of science [1]	4	.3	2	1.6	2	.3	-------	-------
Professional	139	10.8	38	30.6	87	12.3	14	3.0
Doctor of medicine	51	4.0	22	17.7	29	4.1	-------	-------
Doctor of veterinary medicine	11	.9	1	.8	10	1.4	-------	-------
Pharmacy	30	2.3	4	3.2	17	2.4	9	1.9
All other	47	3.6	11	8.9	31	4.4	5	1.1

[1] The master's degree is assumed, whether or not reported.

The schedule on which training was reported requested each individual to state the amount of both his academic college work and his professional training and to record degrees earned. Although much of the laboratory workers' education should be professional training, fewer than one-fourth of them reported any of their college work in that category. In view of this fact, academic work and professional training have been combined in table 5 to show the length of training beyond high school for the three classes of workers. The training of a substantial number of individuals (10 percent) is labeled "unspecified" in the table. These workers submitted schedules with some evidence of training beyond high school but the information was reported in such a way that the amount could not be exactly determined in terms of years.

TABLE 5.—*Aggregate years of training beyond high school* [1] *reported by laboratory workers*

Aggregate years of training beyond high school	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,291	100.0	124	100.0	703	100.0	464	100.0
Less than 1 [2]	57	4.4			22	3.1	35	7.6
1	64	5.0			22	3.1	42	9.1
2	85	6.6	5	4.0	31	4.4	49	10.6
3	62	4.8	5	4.0	25	3.6	32	6.9
4	525	40.7	50	40.3	331	47.1	144	31.0
5	136	10.5	14	11.3	81	11.5	41	8.8
6	96	7.4	14	11.3	61	8.7	21	4.5
7	53	4.1	11	8.9	35	5.0	7	1.5
8	46	3.6	6	4.8	33	4.7	7	1.5
9 or more	34	2.6	12	9.7	20	2.8	2	.4
Unspecified [3]	133	10.3	7	5.7	42	6.0	84	18.1

[1] Including academic and graduate college work and professional school training.
[2] Includes those who reported definitely that they had no training beyond high school.
[3] Includes those who did not report on college work

The modal number of years of education beyond high school for each of the groups is four, although the proportion with less than that amount is much greater among assistants than among directors or expert technicians. Only 28 percent of the total have had more than the modal 4 years of training but 46 percent of the directors and 33 percent of the technicians have had 5 or more years of education beyond high school. In comparison with other professional groups in public health, laboratory personnel have, as a class, a more extensive basic training than sanitation workers but less training than physicians.[3]

Public health training.—Training in the special techniques of public health has not been emphasized for laboratory workers as it has for

[3] No comparison is made between the laboratory workers' training and the total years of training reported by nurses since it could not always be determined in individual cases how much time nurses spent in their professional (nursing) education. (*Cf.* No. III in this series of papers, Nurses.)

physicians, nurses, and sanitarians. Neither of the professional training committees [4] has set up standards of public health training for laboratory workers, nor has there been any particular concern expressed regarding their lack of it. At various times there has been discussion of the necessity for study in clinical pathology, serology, biochemistry, and fundamental sciences by this group,[5] but no mention has been made of specialized training in a graduate school of public health. In fact, it is doubtful that the work of a health department laboratory is sufficiently different from other laboratory work in medicine to require specialized *public health* training for all its personnel. It is rather surprising, therefore, to find that over 20 percent of the laboratory workers have had some public health training and over 5 percent have had a year or more (see table 6). Fifteen percent have had some type of special courses in public health and another very small proportion have had less than a year of graduate public health training. The differences between the three groups of personnel are similar to those shown in relation to academic training, i. e., the proportion with public health training is greatest among directors (who need it) and least among assistants. There is almost as high a percentage of directors (19.4) as of medical health officers (21.8) with a year or more of training.[6]

TABLE 6.—*Public health training reported by laboratory workers*

Public health training	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,291	100.0	124	100.0	703	100.0	464	100.0
None	997	77.2	76	61.3	548	78.0	373	80.4
Special courses only	197	15.3	19	15.3	104	14.8	74	15.9
Less than 1 year	25	1.9	5	4.0	15	2.1	5	1.1
Year or more	72	5.6	24	19.4	36	5.1	12	2.6
Certificate or degree	48	3.7	23	18.5	21	3.0	4	0.9

Judging from the reported length and character of their training, laboratory workers on the whole would seem to be better prepared for the tasks they are required to perform than any of the three groups previously studied.

[4] The Committee on Professional Education of the American Public Health Association and the Committee on Professional Education and Qualifications of Public Health Personnel, representing the Conference of State and Territorial Health Officers.

[5] For example, see Part I, Proceedings, Assembly of Laboratory Directors and Serologists, October 1938 (Supplement No. 9 to Venereal Disease Information), pp. 102–131.

[6] *Cf.* No II in this series, Health Officers and Other Medical Personnel.

EMPLOYMENT EXPERIENCE

Laboratory workers reported their employment more completely than any other major professional group.[7] Only 15 percent failed to report sufficient employment to account for the period of availability. The following tabulations may, therefore, be taken to represent almost all of the prior experience of the laboratory personnel.

Types of experience reported.—The experience of almost 40 percent of the workers has been confined to the field of public health. Twenty percent have had no other jobs than the ones in which they are now working. For the remaining three-fifths who have worked in other fields, the types of previous experience are shown in table 7. It is apparent that earlier employment reported by 26.7 percent of the workers was wholly unrelated to laboratory work. Approximately 32 percent have worked as chemists or bacteriologists and 9 percent have had other types of laboratory or scientific experience. Among the three groups, the employment reported by directors is most closely related to laboratory service and that by assistants least so. In fact, almost one-half of the assistants report only jobs having no relation to laboratory work.

TABLE 7.—*Types of prior experience reported by laboratory workers*

Type of experience reported	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,291	100.0	124	100.0	703	100.0	464	100.0
Public health only	485	37.6	38	30.6	269	38.3	178	38.4
Other than public health [1]	806	62.4	86	69.4	434	61.7	286	61.6
Chemist	168	13.0	22	17.7	120	17.1	26	5.6
Bacteriologist	240	18.6	58	46.8	151	21.5	31	6.7
Entomologist	6	.5			4	.6	2	.4
Microscopist	6	.5	2	1.6	2	.3	2	.4
Analyst (laboratory)	13	1.0	3	2.4	6	.9	4	.9
Instructor in science	43	3.3	11	8.9	28	4.0	4	.9
Laboratory research, not otherwise specified	51	4.0	4	3.2	36	5.1	11	2.4
Unrelated employment	345	26.7	7	5.6	124	17.6	214	46.1

[1] Combinations are not shown, but number and percentage reporting each type are shown.

Public health experience.—A broad experience in many public health organizations is perhaps less essential to laboratory workers, particularly those engaged in the diagnostic and routine analytical work, than to the medical, nursing, and sanitation personnel. Aside from differences in research work that various laboratories may be carrying on, the problems confronting a worker in one position are in many

[7] See especially No. II in this series, Health Officers and Other Medical Personnel, for the method of determining adequacy of employment reporting, as determined by the relationship of present age and probable date of first employment to the number of years reported.

respects identical with those in another. For that reason, the somewhat limited nature of the public health experience of the workers, as revealed by the number of positions they have held (see table 8), does not necessarily detract from the quality of laboratory service rendered, as it might in some of the other branches of the department. This is particularly true in reference to technicians and assistants, both of which groups report a relatively small number of positions. The directors, on the other hand, have had many more affiliations; three-fourths of them report more than one position.

TABLE 8.—*Number of positions in public health reported by laboratory workers*

Number of public health positions reported	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,291	100.0	124	100.0	703	100.0	464	100 0
1 [1]	758	58.7	34	27 4	391	55 6	333	71 8
2	285	22 1	30	24.2	180	25 6	75	16 2
3	133	10.3	24	19 4	79	11 2	30	6 5
4	65	5.0	25	20.2	26	3 7	14	3 0
5	31	2.4	8	6.4	18	2.6	5	1 1
6	8	.6			6	.9	2	.4
7	5	.4	1	.8	1	.1	3	.6
8 or more	6	.5	2	1.6	2	.3	2	.4
Average	1.8		2.7		1.8		1.5	

[1] Includes those reporting only the present position.

The relatively large number reporting only one job in public health would indicate that laboratory work in health departments is a stable occupation. Even the workers who change positions have tended to remain in public health. Only 8 percent of the expert technicians and 6 percent of the assistants have had any employment in other fields after entering public health. Twenty-seven percent of laboratory directors have, however, worked in other fields after entering public health employment. But since directors represent less than 10 percent of the total, the number whose public health experience has been interrupted by outside employment is still extremely small.

Since relatively few individuals have had more than one position in public health or any interruption to their continuity of service, the length of public health experience becomes another indication of the stability of laboratory work in health departments. The distributions of the three groups of workers, by length of public health experience, is summarized in table 9. This professional class, as a whole, has an average of 9.1 years of public health experience, including the present position.[8] Laboratory directors, with an average of more than 14 years, have had the longest experience in the field,

[8] This average represents only the length of service to the time of reporting. It does not represent completed experience.

although expert technicians average 10 years and laboratory assistants 6.3 years. Fewer than 10 percent of laboratory assistants, who are much younger than the other two groups, have been in public health as long as 15 years, but 4 out of 9 laboratory directors, the oldest group, have been in the field 15 years or more.

TABLE 9.—*Length of experience in public health*[1] *reported by laboratory workers*

Years of experience in public health reported	All laboratory workers		Directors of laboratories		Expert technicians		Laboratory assistants	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,291	100.0	124	100 0	703	100.0	464	100.0
Under 5	563	43 6	18	14.5	262	37.3	283	61.0
5–9	243	18 8	20	16.1	143	20.3	80	17.2
10–14	204	15.8	28	22 6	122	17.4	54	11.6
15–19	140	10 9	31	25 0	79	11 2	30	6.5
20–24	75	5.8	14	11 3	48	6.8	13	2 8
25 or more	66	5.1	13	10.5	49	7.0	4	.9

[1] Including the present position.

In general, employment on the staff of a health department laboratory may be characterized, in terms of the experience of existing personnel, as highly stable, of relatively long duration, but with little variety or change from one department to another.

SUMMARY AND DISCUSSION

1. Laboratory workers, aggregating somewhat less than 8 percent of professional public health personnel, are in general under the supervision of State health departments. This is the only major professional group in public health in which, as a whole, there is an approximately equal division between the sexes. Two out of three laboratory assistants are women.

2. The average age of all laboratory workers is 36.5 years, although laboratory directors, averaging 44 years of age, are considerably older than either the expert technicians or laboratory assistants. Laboratory workers, though somewhat younger, resemble in age distribution the public health nursing group.

3. With the exception of physicians, the laboratory personnel have the most extensive academic and professional training in the public health field. More than two-thirds of all laboratory workers have college degrees and almost one-fourth of them have done some graduate work. One-seventh of all laboratory workers have graduate degrees.

4. Since specific training in public health is not commonly considered an essential for all laboratory workers, it is rather surprising to find that, as a whole, they have more of such training than sanitation

personnel. Relatively almost as many laboratory directors as medical health officers have a year or more of graduate public health training.

5. The prior employment of laboratory workers, which was somewhat better reported than that of the other professional groups, does not appear to have particular bearing on their present employment. Aside from public health experience, and except among laboratory directors, almost half of whom have had prior experience as bacteriologists, no one kind of related experience is reported in more than 22 percent of the cases.

6. With an average experience of 9 years (but only 1.8 positions) in public health, laboratory personnel are a stable occupational group. Among the fewer than 10 percent of all employees who have had interrupted service in public health, the average number of periods of employment in other fields is only 1.7.

7. Perhaps because of the nature of their training and the kind of work done by laboratory personnel, there seems very little tendency for them to move from place to place or change positions.

CONTRIBUTIONS TO OUTSIDE JOURNALS OF THE PERSONNEL OF THE UNITED STATES PUBLIC HEALTH SERVICE

January–December 1940

The following list includes the contributions of United States Public Health Service personnel published during the calendar year 1940 in journals other than the Public Health Reports, Hospital News, and other periodicals of the Service. It also includes books, monographs, and reports issued by private publishers or other agencies. The references do not include contributions of the staffs of St. Elizabeths Hospital and Freedmen's Hospital, both of which institutions were transferred to the Public Health Service July 1, 1940. Contributions published in the Public Health Reports will be found in the semiannual indices of that publication.

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[1] Not employed by the U. S. Public Health Service.

MOTOR VEHICLE ACCIDENT FATALITIES IN THE UNITED STATES, 1939

There were 32,386 deaths from motor vehicle accidents in the United States in 1939,[1] giving a death rate of 24.7 per 100,000 population. This is the lowest rate reported in the United States since 1933.

No distinction is made between traffic and nontraffic accidents in this classification. Automobile accidents (other than collisions with trains or street cars) accounted for 30,466, or 94 percent, of the total deaths due to motor vehicle accidents.

The death rates from these accidents are higher for the Mountain and Pacific States than for any other geographic region. The rates in 1939 were particularly high for Nevada, Wyoming, Arizona, California, and New Mexico. In some of these States, however, a large proportion of the high rate is due to the involvement of the residents of other States in the fatal accidents.

The number of motor vehicle accident fatalities was lowest for the first 6 months of the year, shows a small peak in July, a drop in August, and the highest rates for the last 4 months of the year. As heretofore, the largest numbers of such accidents by days of the week occurred on Saturday and Sunday, reflecting the increased week-end travel. The average daily number of these fatalities in 1939 was approximately 89.

Among white persons the ratio of these deaths in males and females was about 3.2 to 1, and in colored about 3.8 to 1.

Automobile accident fatalities are an important public health problem, since they are responsible for approximately twice as many victims each year as typhoid fever, cerebrospinal meningitis, scarlet fever, whooping cough, diphtheria, dysentery, malaria, measles, poliomyelitis, pellagra, and smallpox combined, more than half as many as pulmonary tuberculosis, and nearly half the mortality caused by pneumonia.

While mechanical faults are responsible for many of these deaths, the personal factor doubtlessly plays the most important part—drunkenness, exhaustion, willingness to take a chance (or the gambling instinct), disregard for traffic regulations and for the rights of others, and the psychological complex which seems to afflict certain drivers. Disease and age also play their role.

Dr. Daniel Blain,[2] of New York, has pointed out that of 4,500,000 traffic accidents of all kinds, one-third are due to accident-prone drivers, who are probably mentally or physically ill, while 3,000,000 accidents, 600,000 injuries, and 20,000 fatalities each year are presumably due to the acts of normal persons whose individual accident rate is lower than that of subnormal drivers, but whose total contribution

[1] Vital Statistics—Special Reports, Vol. 11, No. 51, Bureau of the Census, U. S. Department of Commerce.
[2] J. Am. Med. Assoc., Sept. 14, 1940, p. 906.

to these injuries and deaths is greater because this group of drivers is the most numerous.

Accident prevention programs have achieved some degree of success, but the preventable loss of life and injury due to motor vehicle accidents surely demands a more careful analysis of the causes of these accidents and a more effective and concentrated program of prevention. The accident-prone drivers should be eliminated by appropriate physical and mental examinations given before the issuance of permits and by the revocation of permits of drivers showing a high frequency accident rate. A more effective educational program directed to both drivers and pedestrians, as well as the encouragement of greater respect for traffic regulations by imposing severer penalties for minor infractions, as some cities are doing, would no doubt contribute to a significant reduction in motor vehicle accident fatalities.

COURT DECISION ON PUBLIC HEALTH

Provisions of city ordinance regulating hours of operation of barber shops held invalid.—(Kentucky Court of Appeals; *City of Louisville* v. *Kuhn*, 145 S.W.2d 851; decided December 6, 1940.) One section of an ordinance of the city of Louisville pertaining to barbering made it unlawful to keep open any barber shop or to conduct any barber business therein on specified holidays or on any other day before 8 a. m. or after 6 p. m., except on Saturday and a day preceding a holiday when the closing hour was 8 p. m. In a suit brought by a barber against the city the plaintiff took the position that the said section of the ordinance was invalid as an improper exercise of the police power in that it invaded fundamental rights guaranteed to him and others similarly situated by both the Federal and State Constitutions. The trial court held the challenged section void and its action was sustained by the court of appeals. The view expressed was that the involved restrictions on the lawful and necessary business of barbering were unreasonable.

DEATHS DURING WEEK ENDED FEBRUARY 22, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 22, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,043	9,409
Average for 3 prior years	9,395	
Total deaths, first 8 weeks of year	78,362	77,350
Deaths under 1 year of age	524	490
Average for 3 prior years	552	
Deaths under 1 year of age, first 8 weeks of year	4,353	4,369
Data from industrial insurance companies:		
Policies in force	64,708,572	66,131,396
Number of death claims	15,265	12,624
Death claims per 1,000 policies in force, annual rate	12.3	10.0
Death claims per 1,000 policies, first 8 weeks of year, annual rate	10.8	10.4

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 1, 1941

Summary

Health conditions with respect to the 9 communicable diseases reported weekly by the State health officers, and included in the following table, remained favorable during the current week, with the single exception of measles. Decreases were recorded for influenza (from 13,688 for the preceding week to 11,767 for the current period), meningococcus meningitis, poliomyelitis, and smallpox, while slight increases were reported for diphtheria, scarlet fever, typhoid fever, and whooping cough.

The number of reported cases of measles increased from 24,079 for the preceding week to 31,490. The current incidence is more than three times the 5-year (1936–40) median, while the total number of cases reported this year to date is about 2½ times the 5-year cumulative median for the corresponding period (first 9 weeks of the year). As the peak for measles does not usually come before the latter part of March or middle of April, the indications are that 1941 will fall into the cyclic (3-year) period of a "measles" year.

The highest current incidence is reported for the Middle Atlantic, East North Central, and South Atlantic States. These areas also show the largest increases for the current week.

Of 35 cases of smallpox, 31 cases were reported in the North Central group of States (9 in Minnesota, 8 in Wisconsin, and 6 in Illinois), and of 23 cases of endemic typhus fever, 10 cases occurred in Georgia. No State reported more than 2 cases of poliomyelitis.

The death rate for the current week for 92 major cities of the United States, as reported by the Bureau of the Census, was 13.0 per 1,000 population, as compared with 12.6 for the preceding week and with a 3-year (1938–40) average of 13.1 (for 88 cities).

Telegraphic morbidity reports from State health officers for the week ended March 1, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Mar. 1, 1941	Mar. 2, 1940		Mar. 1, 1941	Mar. 2, 1940		Mar. 1, 1941	Mar. 2, 1940		Mar. 1, 1941	Mar. 2, 1940	
NEW ENG.												
Maine	0	1	1	28	3	5	88	336	165	0	0	0
New Hampshire	0	0	0	10	------	------	37	23	13	0	0	0
Vermont	0	0	0	------	------	------	47	11	23	0	0	0
Massachusetts	1	3	5	------	------	------	682	329	916	1	4	4
Rhode Island	0	0	0	2	------	------	4	183	43	1	0	0
Connecticut	1	4	4	62	7	17	52	150	150	1	0	1
MID. ATL.												
New York	18	18	31	[1] 68	[1] 68	[1] 68	5,545	468	1,224	0	1	10
New Jersey	11	7	13	183	29	29	2,023	73	159	1	1	3
Pennsylvania	16	28	38	------	------	------	4,434	254	388	7	12	6
E. NO. CEN.												
Ohio	5	12	24	104	253	103	3,149	28	34	1	3	3
Indiana	11	12	17	97	52	52	478	23	23	1	1	1
Illinois	34	18	39	49	52	52	2,861	30	30	0	2	5
Michigan [2]	4	1	12	112	20	10	3,496	213	213	0	1	1
Wisconsin	0	5	5	240	173	120	668	233	233	0	0	2
W. NO. CEN.												
Minnesota	1	8	3	19	3	3	4	253	253	1	0	1
Iowa	3	3	4	194	65	27	160	309	54	0	0	0
Missouri	12	19	19	18	32	382	141	54	20	0	1	2
North Dakota	3	2	1	85	44	31	8	11	8	0	0	0
South Dakota	1	1	1	2	1	2	21	0	0	0	0	1
Nebraska	0	0	4	------	------	------	4	49	29	0	0	1
Kansas	5	5	11	91	41	41	429	639	12	0	0	1
SO. ATL.												
Delaware	1	0	0	------	------	------	312	1	26	0	0	0
Maryland [2]	3	4	9	113	55	72	115	2	146	3	1	4
Dist. of Col.	2	7	7	15	4	3	67	2	19	1	0	2
Virginia	10	12	16	1,600	1,696	------	1,864	30	218	0	0	5
West Virginia [2]	6	8	8	321	1,500	271	189	9	21	3	1	2
North Carolina	14	13	16	154	52	97	490	183	183	4	2	5
South Carolina	2	5	6	1,056	945	1,181	268	6	27	5	0	1
Georgia [3]	2	13	6	547	590	590	200	94	94	0	3	2
Florida [3]	9	10	8	229	9	9	395	68	68	1	0	0
E. SO. CEN.												
Kentucky	3	8	13	107	107	107	723	32	73	6	1	6
Tennessee	3	4	8	548	231	231	185	78	78	1	2	2
Alabama [3]	2	6	11	490	528	599	305	224	224	1	1	1
Mississippi [2]	3	8	4	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas	3	2	3	711	838	303	146	17	17	0	0	0
Louisiana [3]	5	3	10	133	194	78	59	12	12	1	3	2
Oklahoma	6	6	9	209	443	334	11	3	84	0	0	0
Texas [3]	39	23	40	3,100	2,547	965	577	465	465	0	1	4
MOUNTAIN												
Montana	0	0	0	29	4	29	9	22	49	0	0	0
Idaho	1	0	0	11	1	8	19	96	28	0	0	0
Wyoming	0	0	0	29	------	------	80	57	17	1	1	0
Colorado	13	7	7	64	25	------	167	25	25	1	0	0
New Mexico	2	0	3	24	2	8	199	4	38	0	0	0
Arizona	4	3	5	181	280	177	111	25	81	0	0	0
Utah [2]	1	3	1	20	17	------	26	341	130	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	4	0	4	14	4	4	121	776	261	0	1	1
Oregon	0	8	1	30	38	97	391	446	60	0	0	0
California [3]	12	21	27	[4] 668	580	580	130	462	462	2	1	5
Total	276	321	472	11,767	11,533	11,533	31,490	7,149	10,396	44	44	103
9 weeks	2,658	3,716	5,056	541,893	124,174	51,047	144,881	44,809	58,065	398	851	858

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 1, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Mar. 1, 1941	Mar. 2, 1940		Mar. 1, 1941	Mar. 2, 1940		Mar. 1, 1941	Mar. 2, 1940		Mar. 1, 1941	Mar. 2, 1940	
NEW ENG.												
Maine	0	0	0	7	3	14	0	0	0	0	0	1
New Hampshire	0	0	0	2	3	4	0	0	0	0	0	0
Vermont	0	0	0	4	2	11	0	0	0	1	0	0
Massachusetts	0	0	0	166	135	229	0	0	0	1	1	1
Rhode Island	0	0	0	8	15	18	0	0	0	0	0	0
Connecticut	0	0	0	35	82	90	0	0	0	2	1	0
MID. ATL.												
New York	1	2	1	467	835	905	0	0	0	10	1	3
New Jersey	1	0	0	365	425	206	0	0	0	1	0	2
Pennsylvania	0	0	1	331	389	512	0	0	0	3	9	3
E. NO. CEN.												
Ohio	2	1	0	251	436	436	0	1	3	3	3	2
Indiana	0	0	1	170	168	204	0	1	4	0	1	2
Illinois	1	1	1	475	703	703	6	4	12	2	3	2
Michigan [2]	0	0	0	280	414	469	0	4	4	3	1	1
Wisconsin	0	3	0	127	136	293	8	13	9	0	0	0
W. NO. CEN.												
Minnesota	0	0	0	42	118	125	9	5	8	1	0	0
Iowa	0	0	0	58	65	126	1	4	20	0	1	0
Missouri	0	0	0	97	101	219	4	4	17	0	7	4
North Dakota	0	0	0	9	17	29	0	0	8	0	0	0
South Dakota	0	0	0	16	14	24	3	0	11	0	0	0
Nebraska	0	0	0	16	19	66	0	0	9	0	0	0
Kansas	0	0	0	73	83	217	0	2	28	0	0	0
SO. ATL.												
Delaware	0	0	0	15	7	9	0	0	0	0	0	0
Maryland [3]	1	0	0	61	43	47	0	0	0	0	2	2
Dist. of Col.	1	0	0	11	26	25	0	0	0	0	0	0
Virginia	0	0	1	35	32	40	0	0	0	2	1	2
West Virginia [3]	1	0	0	35	53	45	0	1	1	0	0	1
North Carolina	1	0	0	55	45	44	0	1	0	0	0	0
South Carolina	0	1	0	13	1	5	0	1	0	3	1	1
Georgia [3]	1	0	0	15	25	13	0	0	1	0	1	1
Florida [3]	2	0	0	1	13	8	0	0	0	5	1	2
E. SO. CEN.												
Kentucky	0	0	0	144	88	76	0	0	0	2	2	2
Tennessee	0	0	0	122	77	37	0	4	4	5	4	1
Alabama [3]	1	0	1	18	18	18	2	0	0	3	1	1
Mississippi [3]	2	1	0	5	8	8	0	0	0	2	0	1
W. SO. CEN.												
Arkansas	1	0	0	17	6	9	0	2	2	4	0	1
Louisiana [3]	1	0	0	11	11	11	0	0	0	4	1	6
Oklahoma	0	0	0	32	13	31	1	1	8	0	1	2
Texas [3]	0	2	1	58	67	89	0	5	5	2	5	7
MOUNTAIN												
Montana	0	0	0	22	33	33	0	0	8	0	0	0
Idaho	0	0	1	6	20	20	0	0	4	1	0	0
Wyoming	0	0	0	3	6	37	0	0	0	1	1	1
Colorado	0	0	0	28	66	66	0	11	8	2	1	1
New Mexico	0	0	0	3	17	27	0	1	0	1	0	4
Arizona	0	0	0	5	14	12	0	1	1	1	1	0
Utah [3]	0	0	0	12	24	42	0	0	0	0	0	0
Nevada	0	-----	-----	0	-----	-----	0	-----	-----	0	-----	-----
PACIFIC												
Washington	0	0	0	27	64	63	1	0	8	4	2	2
Oregon	0	0	0	13	32	34	0	1	9	1	0	0
California [3]	1	4	3	118	175	250	0	0	12	2	0	8
Total	18	15	17	3,884	5,147	6,224	35	67	293	72	53	88
9 weeks	289	275	192	30,370	40,913	54,300	413	640	2,657	631	670	965

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 1, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough, Week ended Mar. 1, 1941	Whooping cough, Week ended Mar. 2, 1940
NEW ENG.		
Maine	28	46
New Hampshire	24	0
Vermont	28	70
Massachusetts	262	119
Rhode Island	12	19
Connecticut	45	63
MID. ATL.		
New York	341	492
New Jersey	107	84
Pennsylvania	421	341
E. NO. CEN.		
Ohio	373	156
Indiana	27	33
Illinois	85	110
Michigan [2]	375	153
Wisconsin	104	130
W. NO. CEN.		
Minnesota	65	28
Iowa	28	7
Missouri	55	11
North Dakota	14	13
South Dakota	7	1
Nebraska	25	4
Kansas	132	36
SO. ATL.		
Delaware	21	8
Maryland [2]	84	207
Dist. of Col	11	6
Virginia	159	45
West Virginia [2]	27	42
North Carolina	280	138
South Carolina	83	22
Georgia [3]	56	11
Florida [3]	21	4
E. SO. CEN.		
Kentucky	67	52
Tennessee	71	81
Alabama [3]	28	12
Mississippi [2]	-------	-------
W. SO. CEN.		
Arkansas	53	1
Louisiana [3]	18	28
Oklahoma	27	5
Texas [3]	348	154
MOUNTAIN		
Montana	32	10
Idaho	14	8
Wyoming	1	12
Colorado	58	11
New Mexico	17	71
Arizona	2	28
Utah [2]	76	117
Nevada	0	-------
PACIFIC		
Washington	107	24
Oregon	10	44
California [2]	341	167
Total	4,570	8,174
9 weeks	37,778	25,267

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Mar. 1, 1941, 23 cases, as follows: Georgia, 10; Florida, 1; Alabama, 3; Louisiana, 3; Texas, 4; California, 2.
[4] Delayed reports of approximately 330 cases included.

MONTHLY REPORTS FROM STATES

Case reports consolidated for the year 1940

Division and State	Diphtheria	German measles	Influenza	Malaria	Measles	Meningitis, meningococcus	Ophthalmia neonatorum	Pellagra	Poliomyelitis	Puerperal septicemia	Rocky Mountain spotted fever	Scarlet fever	Small pox	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Whooping cough
NEW ENG.																	
Maine	53	221	217	1	10,046	11	4	1	11	....	0	432	0	41	....	27	1,664
New Hampshire	1	....	4	....	1,041	0	....	....	6	....	0	109	0	7	....	2	332
Vermont	4	102	21	....	492	4	....	....	4	....	0	354	0	23	....	45	1,135
Massachusetts	158	558	....	7	21,704	47	[1] 447	13	46	....	0	5,279	0	196	....	52	7,959
Rhode Island	17	42	2	1	5,287	11	1	....	15	....	0	491	0	29	1	12	427
Connecticut	42	133	152	5	2,773	15	2	....	17	....	0	2,544	0	113	....	91	2,704
MID. ATL.																	
New York	535	1,869	....	134	25,802	148	[2] 97	....	230	....	1	23,039	0	457	42	257	18,199
New Jersey	336	646	465	14	16,878	20	130	....	58	....	10	10,093	0	122	3	73	5,434
Pennsylvania	836	680	....	16	18,237	231	43	6	170	....	9	12,946	0	543	1	124	20,000
E. NO. CEN.																	
Ohio	614	276	1,937	49	1,619	50	....	3	641	15	3	10,960	21	343	2	109	11,928
Indiana	440	....	13,217	27	656	42	....	....	682	....	10	5,324	99	160	1	57	1,330
Illinois	942	383	1,124	199	8,669	50	37	8	583	....	17	20,817	167	335	....	157	6,410
Michigan	264	505	379	60	20,209	47	....	....	1,216	....	0	10,337	76	135	....	109	11,726
Wisconsin	69	236	3,191	5	20,386	27	2	....	504	....	0	5,311	186	41	1	132	5,717
W. NO. CEN.																	
Minnesota	121	....	143	10	5,219	15	1	2	248	....	0	3,355	389	59	....	129	2,445
Iowa	190	56	643	60	6,018	27	....	2	931	....	19	2,560	412	91	....	250	1,152
Missouri	367	....	439	100	686	33	1	2	313	....	9	2,421	100	320	2	25	1,607
North Dakota	136	7	940	....	189	9	1	....	34	....	0	590	88	37	....	7	657
South Dakota	63	....	70	....	176	6	....	....	81	....	1	678	95	16	....	4	171
Nebraska	69	....	38	....	1,042	15	....	....	182	....	0	732	33	27	....	12	478
Kansas	250	108	5,232	23	11,565	33	....	4	537	....	0	2,906	16	128	2	163	2,621

[1] Also reported were 408 cases including suppurative conjunctivitis.
[2] Exclusive of New York City.

Division and State	Diphtheria	German measles	Influenza	Malaria	Measles	Meningitis, meningococcus	Ophthalmia neonatorum	Pellagra	Poliomyelitis	Puerperal septicemia	Rocky Mountain spotted fever	Scarlet fever	Smallpox	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Whooping cough
SO. ATL.																	
Delaware	16	3			121	1	3		2		6	376	0	23		5	659
Maryland	152	77	1,250	14	249	24	5	5	16		52	1,630	0	123	4	27	6,196
Dist. of Col.	180		143		102	9		1	8		9	792	0	31		5	472
Virginia	712		22,975	110	4,171	77		84	242		43	1,781	5	278	8	22	2,910
West Virginia	338		7,544	9	694	72		10	662		2	1,889	6	213	1	5	2,233
North Carolina	1,121	125	2,113	653	3,685	34		97	74		19	2,442	6	241	65	11	5,500
South Carolina	1,150	111	28,937	9,435	619		33	1,494	19		0	459	8	276	132	33	1,064
Georgia	496		12,106	2,258	3,210	22		253	28	5	7	985	11	483	574	121	925
Florida	227	98	631	148	2,323	7		97	34		0	262	9	120	114	47	376
E. SO. CEN.																	
Kentucky	380	776	2,548	48	3,425	59		11	224		5	2,818	7	404		24	3,658
Tennessee	322	211	4,780	903	3,095	51	26	123	49	21	10	2,979	49	332	30	39	2,117
Alabama	549	349	11,495	9,442	3,205	83	11	294	54		0	939	51	278	291	70	1,004
Mississippi	366		85,149	40,965	5,604	28	95	4,089	39	353	0	466	18	208	49	30	9,458
W. SO. CEN.																	
Arkansas	397	16	20,371	3,511	1,181	12	7	444	29	12	0	456	81	524		21	844
Louisiana	366		16,221	519	289	34	4	54	129		0	469	5	560	118	72	1,302
Oklahoma	481		8,466	1,871	433	33	3	122	138		10	893	157	341	6	112	764
Texas	1,450		57,289	6,606	17,612	73	47	1,367	187		0	1,802	121	1,000	410	414	10,414
MOUNTAIN																	
Montana	117	28	1,565	1	1,310	15	1		108		31	1,044	8	32	1	7	197
Idaho	28	94	1,255	6	1,611	7			66		17	480	6	79		5	478
Wyoming	40	63	1,693	7	704	8			41	2	61	266	7	25		19	251
Colorado	364		1,718	3	1,558	10			39		10	1,502	302	83		50	948
New Mexico	73	38	352	90	1,338	8		23	26	16	1	421	14	157		28	1,585
Arizona	167	90	10,898	35	2,217	16		27	13		0	304	21	66	2	29	1,148
Utah	26	129	20,058	5	10,231	3			59		15	611	15	32		13	5,037
Nevada	5		2,486	1	61	5			3	2	10	72	[illegible]	10		[illegible]	[illegible]

PACIFIC																	
Washington	101	569	9,524	2	17,254	23			444	1	5	1,696	14	92		27	2,576
Oregon	231		8,100	32	9,432	11			63		22	711	55	77		5	1,197
California	890	1,083	55,191	168	12,363	65	37	52	476		3	5,884	104	347	19	278	15,813
Total	16,252	9,682	423,072	77,553	286,791	1,631	1,038	8,688	9,781	427	417	155,707	2,764	9,658	1,879	3,358	183,273
Alaska	18	4	497		1,098	2				1		14	1	9		2	21
Hawaii	77	191	16,550	7	578	7	4		57			4	1	67	70	2	680
Puerto Rico [3]	449		79,694	16,475	701	5	35	27	7	81		1		307			1,069

Case reports consolidated for the year 1940—Continued

Division and State	Actinomycosis	Chickenpox	Dysentery, amoebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	Encephalitis, equine	Hookworm disease	Mumps	Rabies in animals	Rabies in man	Septic sore throat	Tetanus	Trachoma	Trichinosis	Tularemia	Vincent's infection
NEW ENG.																	
Maine	1	2,401							337	3		25	2		3		43
New Hampshire		377							327			6					
Vermont		1,746		4					824			5					151
Massachusetts	4	12,857	5	326		13			6,257	72		213	17	14	46		
Rhode Island		978	1	1		3			752	31	1	172			1	1	
Connecticut		5,899	1	86		7			2,893			271	8	4	29	1	
MID. ATL.																	
New York		30,355	63	572		109				[2] 130	2	1,364	47		277	2	[2] 447
New Jersey		16,016	29	10		20			12,822	402	3	141	10	4	30	2	
Pennsylvania		35,483	23	20		20			11,899		1			2	14	49	
E. NO. CEN.																	
Ohio		15,443	4	288		17			5,068		4	145	24	45	29	62	
Indiana		2,840		16		7			4,324	259	1	34	5	14		119	
Illinois	11	18,053	67	138		32		1	6,408	241	1	67	42	323	13	273	300
Michigan	4	17,878	15	26		10		1		19		1,166	14	3	15	12	204
Wisconsin		22,305	2			6			10,949			166		1		23	
W. NO. CEN.																	
Minnesota	9	7,423	29	120		11				37		146	9	10	2	14	
Iowa		2,306	5	7	5	38			3,098	30		57				77	
Missouri		1,457	1	19	47	5			721	2	1	77	4	375	1	106	
North Dakota	2	1,234			2	21			1,206			16		14			27
South Dakota		826							268			40		75			
Nebraska		1,061				7			1,236			6					
Kansas	1	4,281	4	12	5	43			1,644	1		195	5	4	1	37	165
SO. ATL.																	
Delaware		628		1		1			64	1		1					
Maryland		4,292	9	107	30	3			602	2		259	8	4	13	22	144
Dist. of Col.		1,073	3			4										2	
Virginia		2,647	12	1,880		5			687			1,500	11	7		47	
West Virginia		1,394		99		3			371		2	77				7	
North Carolina		4,360		9							1	88		8		11	134
South Carolina		1,100	6			8		1,567	503	189	3	40	8			15	
Georgia		1,383	85	331	84			17,383	1,076			893	12	9		102	
Florida		2,008	37	8		7		8,623	279	15		44	10	1		16	53

E. SO. CEN.																	
Kentucky		2,975	10	232		13			3,331		1	555		124		132	54
Tennessee	1	1,801	18	321		7		73	1,010	1	1	337	14	144		76	200
Alabama		1,148	6			23			845	202	1		36	3		8	
Mississippi		4,099	1,784	9,787				7,241	3,573	73				107		7	
W. SO. CEN.																	
Arkansas		780	128	358		2		47	909	189	5	839	12	1,045	2	68	
Louisiana		415	37	17		4		586	92	87		59	41	120		34	
Oklahoma		984	22	603		7		2	409	142		594	7	763		62	118
Texas		5,939	331	2,989		23			2,057	30				83		40	
MOUNTAIN																	
Montana		1,967		34	1	61			897			75	2	75		19	5
Idaho		941	3	1		3			567			42		1		6	11
Wyoming		630		1	11	7			862			33			1	80	12
Colorado		2,437	11	94		53			6,150			127				14	
New Mexico	3	1,038	17	86	66	2			520	104	1	35		23		5	
Arizona		1,009			1,077	9			1,598			1		595		6	
Utah		3,494	5		156	2			1,190	2		90		222		54	
Nevada		356	1			2	1		33			30		1		8	1
PACIFIC																	
Washington	1	5,540	8	35		22	86		2,911	49		39	3	24		1	18
Oregon		2,308	26	3		2			1,542	52		39		7		5	80
California		21,194	183	511		182		12	14,282	396	2	89	61	235	44	16	
Total	37	279,159	2,991	19,152	1,484	824	87	35,536	117,693	2,761	31	10,198	412	4,489	521	1,641	2,167
Alaska		206							2			56					6
Hawaii	1	602	41					154	259			2	25	18	1		
Puerto Rico [3]		305			440				24				[4] 142				2

[2] Exclusive of New York City.
[3] Reports for January to September, inclusive.
[4] 20 cases infantile tetanus included.

Anthrax: Massachusetts, 8; New York, 16; New Jersey, 12; Pennsylvania, 24; Ohio, 1, Delaware, 1; Arkansas, 2; Louisiana, 2; Texas, 1; Montana, 1; Colorado, 1; Arizona, 1, Utah, 1; California, 4.
Beriberi: California, 2.
Botulism: New York, 1; Washington, 4, California, 13.
Colorado tick fever: Idaho, 2; Wyoming, 13; Utah, 2.
Dengue: South Carolina, 32; Florida, 5; Mississippi, 9; Louisiana, 6; Texas, 6.
Diarrhea: Ohio, 1,182 (under 2 years; enteritis included); Michigan, 31;(infant diarrhea): Maryland, 143; South Carolina, 9,529; New Mexico, 197; Nevada, 2 (infant diarrhea)
Enteritis: Kansas, 1; Washington, 139 (61, under 2 years; 78, over 2 years).
Filariasis: Puerto Rico [3], 12.
Food poisoning: Kansas, 5; New Mexico, 4, Washington, 169; California, 848.
Granuloma, coccidioidal: California, 53.
Leprosy: Hawaii Territory, 37; Puerto Rico,[3] 12; Massachusetts, 1; Pennsylvania, 1, Indiana, 1; Illinois, 3; Missouri, 1; Maryland, 1; Florida, 4; Louisiana, 20; Texas, 16; California, 5.
Plague, bubonic: Idaho, 1.
Psittacosis: Connecticut, 1; New York, 1; Pennsylvania, 1; Ohio, 1; Minnesota, 2; California, 2.
Rat bite fever: Missouri, 1; Tennessee, 2.
Relapsing fever: Kansas, 1; Oklahoma, 9; Texas, 11; California, 19.
Weil's disease. Hawaii Territory, 5; Michigan, 17.

WEEKLY REPORTS FROM CITIES

City reports for week ended February 15, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of sho ing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	146	1,179	142	4,289	935	1,889	32	387	18	1,078	....
Current week [1]	74	1,580	121	8,635	681	1,139	4	347	10	1,144	....
Maine:											
Portland	0	......	....	1	......	0	0	......	0	7	....
New Hampshire:											
Concord	0	......	1	0	3	1	0	0	0	0	17
Manchester	0	......	1	0	1	8	0	0	0	0	11
Nashua	0	......	0	0	0	0	0	0	0	2	2
Vermont:											
Barre	......	......	......	......	......	......	......	......	......	......	......
Burlington	0	......	0	0	0	0	0	0	0	0	10
Rutland	0	......	0	0	1	0	0	0	0	0	12
Massachusetts:											
Boston	1	......	4	184	17	26	0	8	1	107	241
Fall River	0	......	0	0	4	7	0	4	0	10	34
Springfield	0	......	0	0	2	7	0	0	0	2	33
Worcester	0	......	0	72	8	4	0	1	0	0	54
Rhode Island:											
Pawtucket	0	......	0	0	4	0	0	0	0	0	24
Providence	1	1	0	0	3	2	0	2	0	7	73
Connecticut:											
Bridgeport	0	12	0	5	3	2	0	0	0	0	56
Hartford	0	3	1	0	3	2	0	2	0	1	49
New Haven	0	2	1	0	5	18	0	0	0	3	57
New York:											
Buffalo	0	......	4	44	12	9	0	5	0	21	145
New York	15	182	7	2,628	127	192	0	60	2	99	1,747
Rochester	0	......	0	6	9	1	0	0	1	14	87
Syracuse	0	......	0	0	3	0	0	3	0	5	72
New Jersey:											
Camden	2	......	0	70	4	6	0	2	0	4	44
Newark	1	32	6	126	7	29	0	2	0	13	97
Trenton	0	5	1	2	4	67	0	2	0	0	54
Pennsylvania:											
Philadelphia	3	10	9	1,097	53	97	0	27	0	58	556
Pittsburgh	1	12	6	18	13	10	0	7	0	74	190
Reading	1	1	0	213	5	0	0	2	0	6	30
Scranton	0	......	....	1	......	2	0	......	0	0	....
Ohio:											
Cincinnati	3	3	1	75	8	19	0	4	0	2	121
Cleveland	0	157	6	1,113	18	28	0	5	0	58	215
Columbus	1	5	5	24	7	6	0	6	0	23	95
Toledo	0	5	2	3	1	5	0	1	0	7	66
Indiana:											
Anderson	0	......	0	0	2	3	0	1	0	0	10
Fort Wayne	1	......	2	31	4	0	0	0	0	1	35
Indianapolis	2	......	2	11	17	18	0	4	0	10	131
Muncie	0	......	0	0	3	8	0	0	0	0	16
South Bend	0	......	0	4	4	0	0	0	0	0	14
Terre Haute	0	2	1	0	5	0	0	0	0	0	21
Illinois:											
Alton	0	1	1	0	0	1	0	0	0	0	11
Chicago	7	20	3	1,383	50	195	0	47	1	57	829
Elgin	0	......	0	14	1	0	0	0	0	0	10
Moline	0	......	0	2	0	0	0	0	0	0	16
Springfield	0	1	2	0	3	9	0	0	0	0	32
Michigan:											
Detroit	0	39	4	752	22	103	0	12	1	122	306
Flint	0	......	1	40	4	1	0	0	0	15	28
Grand Rapids	0	......	1	37	3	4	0	0	0	14	61
Wisconsin:											
Kenosha	0	......	0	75	2	1	0	0	0	0	15
Madison	0	......	0	0	0	1	0	0	0	0	19
Milwaukee	0	......	0	60	4	25	0	1	0	40	125
Racine	0	......	0	1	0	3	0	0	0	4	15
Superior	0	......	0	0	0	15	0	0	0	0	8

[1] Figures for Barre and Tampa estimated; reports not received.

City reports for week ended February 15, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	8	0	1	0	1	0	1	0	6	30
Minneapolis	1	211	1	1	10	14	3	0	0	15	127
St. Paul	0	2	2	4	7	3	0	2	0	10	68
Iowa:											
Cedar Rapids	0	...	...	0	...	3	0	...	0	0	...
Davenport	0	...	...	0	...	1	0	...	0	0	...
Des Moines	0	...	...	0	...	7	0	...	0	2	30
Sioux City	1	...	...	0	...	0	0	...	0	4	...
Waterloo	1	...	...	2	...	1	0	...	0	2	...
Missouri:											
Kansas City	0	6	3	3	6	7	1	5	0	9	115
St. Joseph	0	...	1	0	3	1	0	1	0	0	24
St. Louis	5	41	3	10	24	57	0	10	0	18	216
North Dakota:											
Fargo	0	...	0	0	2	0	0	0	0	7	12
Grand Forks	0	...	...	0	...	0	0	...	0	1	...
Minot	1	...	...	0	...	0	0	...	0	2	6
South Dakota:											
Aberdeen	0	...	...	0	...	1	0	...	0	2	...
Sioux Falls	0	...	...	0	...	4	0	...	0	0	9
Nebraska:											
Lincoln	1	...	...	1	...	4	0	...	0	1	...
Omaha	0	...	0	0	8	5	0	0	0	1	71
Kansas:											
Lawrence	0	3	0	2	0	0	0	0	1	0	4
Topeka	0	1	1	36	2	4	0	0	0	2	13
Wichita	0	2	0	1	4	5	0	0	0	30	38
Delaware:											
Wilmington	0	...	0	49	5	5	0	2	0	3	37
Maryland:											
Baltimore	0	24	2	13	20	23	0	9	0	77	255
Cumberland	0	5	0	0	1	0	0	0	0	0	9
Frederick	0	...	0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	0	37	0	31	21	7	0	12	0	10	195
Virginia:											
Lynchburg	0	...	0	0	2	0	0	0	0	2	9
Norfolk	1	91	0	17	3	1	0	0	0	0	36
Richmond	1	...	4	11	4	3	0	2	0	1	56
Roanoke	0	...	0	225	1	2	0	0	0	9	19
West Virginia:											
Charleston	0	2	0	10	8	0	0	0	0	0	28
Wheeling	0	...	0	0	1	0	0	0	0	4	22
North Carolina:											
Gastonia	0	3	...	3	...	0	0	...	0	13	...
Raleigh	0	...	1	37	3	0	0	0	0	12	17
Wilmington	1	...	0	3	1	0	0	0	0	0	13
Winston-Salem	0	3	0	0	3	1	0	1	0	6	17
South Carolina:											
Charleston	0	110	2	11	5	2	0	2	0	2	32
Florence	0	76	0	28	3	0	0	1	0	1	18
Greenville	0	...	1	13	1	0	0	0	0	8	6
Georgia:											
Atlanta	0	15	4	12	7	3	0	8	1	0	99
Brunswick	0	...	0	0	2	0	0	0	0	0	5
Savannah	0	52	3	1	1	0	0	1	0	0	28
Florida:											
Miami	0	24	0	4	1	2	0	0	0	0	37
Tampa	...	...	...	...	...	...	...	...	...	...	...
Kentucky:											
Ashland	0	...	0	0	3	0	0	1	0	0	9
Covington	0	17	0	2	3	0	0	2	0	1	17
Lexington	0	...	0	15	3	0	0	2	0	4	21
Tennessee:											
Knoxville	0	...	1	6	2	16	0	2	1	2	22
Memphis	0	10	8	20	7	6	0	5	1	2	92
Nashville	0	...	2	6	5	5	0	2	0	7	53
Alabama:											
Birmingham	0	117	3	40	8	1	0	2	0	7	78
Mobile	0	2	1	0	1	0	0	1	0	0	27
Montgomery	0	3	...	3	...	2	0	...	0	12	...

City reports for week ended February 15, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0			0		0	0		0	0	
Little Rock	0	69	1	0	8	1	0	1	0	1	43
Louisiana:											
Lake Charles	0		0	0	1	0	0	0	0	0	6
New Orleans	3	7	2	6	16	4	0	15	1	2	167
Shreveport	0		0	0	0	0	0	1	0	3	43
Oklahoma:											
Oklahoma City	0	16	1	0	4	3	0	1	0	0	58
Tulsa	4		1	0	2	5	0	2	0	12	31
Texas:											
Dallas	0	1	1	4	2	4	0	3	0	1	88
Fort Worth	0		2	149	2	2	0	1	0	1	35
Galveston	1		0	0	1	0	0	1	0	0	11
Houston	2	3	2	0	8	1	0	5	0	0	85
San Antonio	1	3	5	1	10	0	0	8	0	1	77
Montana:											
Billings	0		0	0	1	2	0	0	0	0	12
Great Falls	0		0	0	1	1	0	0	0	0	4
Helena	0		0	0	0	0	0	0	0	1	9
Missoula	0		0	0	0	0	0	0	0	0	8
Idaho:											
Boise	0		0	1	0	0	0	0	0	0	5
Colorado:											
Colorado Springs	0		0	4	1	1	0	1	0	1	9
Denver	9	25	0	7	3	7	0	3	0	21	66
Pueblo	0		0	1	0	2	0	0	0	13	5
New Mexico:											
Albuquerque	0		0	7	2	2	0	1	0	0	12
Utah:											
Salt Lake City	1		0	3	2	2	0	2	0	14	30
Washington:											
Seattle	2	2	1	3	4	4	0	5	0	5	105
Spokane	0		0	6	3	1	0	0	0	0	29
Tacoma	0		0	0	2	0	0	0	0	2	38
Oregon:											
Portland	0	4	0	15	5	4	0	1	0	4	77
Salem	0			0		0	0		0	0	
California:											
Los Angeles	2	64	2	4	5	27	0	20	1	16	337
Sacramento	3		1	0	3	8	0	0	0	4	30
San Francisco	2	270	0	2	3	13	0	9	0	43	165

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Vermont:			
Burlington	1	1	0
New York:			
Buffalo	1	1	0
New York	2	0	2
Pennsylvania:			
Pittsburgh	1	0	0
Indiana:			
Indianapolis	1	0	0
Muncie	1	0	0
Illinois:			
Chicago	0	0	1
Minnesota:			
St. Paul	0	0	1
Missouri:			
St. Louis	1	0	0
Maryland:			
Baltimore	2	0	1
South Carolina:			
Charleston	2	0	0
Georgia:			
Savannah	0	0	1
Tennessee:			
Knoxville	3	0	0
Memphis	1	0	0
Alabama:			
Mobile	1	1	0
Louisiana:			
Shreveport	0	2	0
Texas:			
Dallas	1	0	0
California:			
Los Angeles	0	0	2

Encephalitis, epidemic or lethargic.—Cases: Denver, 1.
Pellagra.—Cases: Philadelphia, 1; Winston-Salem, 2; Atlanta, 2; Dallas, 1; San Francisco, 1.
Typhus fever.—Cases: Savannah, 1; New Orleans, 2; Houston, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on January 23, 1941, near Paauhau landing, in Paauhau area, Hamakua District, Island of Hawaii, has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 25, 1941.—During the week ended January 25, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	9	1	7	13	2	3	3	8	47
Chickenpox		15	16	209	343	32	28	38	107	788
Diphtheria		24		8	2	1	4	1		40
Dysentery				2						2
Influenza		118			157	52	3		228	558
Measles		477	57	93	709	233	484	447	527	3,027
Mumps				79	157	18	1	24	17	296
Pneumonia		5			19	5	2		20	51
Scarlet fever		24	8	115	192	10	10	21	12	392
Tuberculosis		4	8	106	43	6				167
Typhoid and paratyphoid fever				34				2	2	38
Whooping cough				379	210	18	7	19	5	638

CUBA

Habana—Communicable diseases—4 weeks ended February 8, 1941.—During the 4 weeks ended February 8, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	25	2	Tuberculosis		1
Malaria	1		Typhoid fever	38	1
Scarlet fever	2				

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of February 28, 1941, pages 416–420. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Morocco.—During the week ended February 8, 1941, 88 cases of plague were reported among the tribes of the Agadir Territory and the Marrakesh region, Morocco.

Yellow Fever

Ivory Coast—Sproa Plantation.—On February 21, 1941, 1 death from suspected yellow fever and on February 22 a case of yellow fever were reported at Sproa Plantation, east of Bingerville, Ivory Coast.

X

Public Health Reports

VOLUME 56 MARCH 14, 1941 NUMBER 11

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

January 26–February 22, 1941

The accompanying table (table 2) summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended February 22, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—The number of reported cases of influenza dropped from 383,630 for the 4 weeks ended January 25 to 146,496 for the 4 weeks ended February 22. However, while the disease has declined in all sections of the country, the total number of cases was more than twice the number reported for the corresponding period in 1940 and more than 5 times the 1936–40 median incidence for this period.

In the Pacific region where the current epidemic started, the incidence dropped below the average seasonal expectancy for this period, but all other regions continued to report a relatively high incidence. Practically every section of the country has been affected by the current epidemic, starting in the Western States with a peak of approximately 37,000 cases reported from the Mountain and Pacific regions during the week ended December 21, 1940; then spreading into the southeastern regions with a peak of approximately 58,000 cases during the week ended January 11; and into the South Atlantic region where the highest weekly incidence was reported during the week ended January 25 (approximately 50,000 cases). In the East North Central, West North Central, and New England regions the disease did not appear until about the middle of January, and in the Middle Atlantic region the highest weekly incidence was reported during the week ended February 1.

Mortality from all causes for the total number of cities reporting still shows, for February, a slight excess over an average rate for the

years 1938–40—13.6 as compared with 13.3 per 1,000. The excess is somewhat less than that reported for the month of January. Table 1 shows weekly rates of mortality from all causes during the first 8 weeks of 1941 for all cities reporting and for nine geographic subdivisions compared with an average rate of the 3 preceding years. Death rates for the first 3 weeks of February for 88 cities combined show a slight excess above the average, while mortality for the fourth week of February was definitely below the average. In all western sections, that is, the Pacific, Mountain, West North Central, and West South Central, and in the East South Central region, mortality from all causes has been below the average since and including the second week in February. In the eastern sections, that is, the East North Central, Middle Atlantic, South Atlantic, and New England, the excess continued through the third week of February. In New England where the excess in mortality from all causes has been most marked, the peak was reached during the fourth week of January; the rate declined during February to a rate below the average for the fourth week of February. In each section of the country, therefore, mortality from all causes had fallen below the average of the preceding 3 years before the end of February.

TABLE 1.—*Mortality from all causes in cities in 9 geographic sections of the United States for the first 8 weeks of 1941 compared with an average of the 3 preceding years* [1]

Section	Death rate per 1,000 (annual basis)							
	Week ended—							
	Jan. 4	Jan. 11	Jan. 18	Jan. 25	Feb. 1	Feb. 8	Feb. 15	Feb. 22
All cities reporting:								
1941	12.9	13.7	13.5	14.6	14.1	14.3	13.6	12.6
Average, 1938–40	13.1	13.1	12.9	13.2	13.5	13.4	13.3	13.3
Pacific:								
1941	13.8	16.6	13.7	15.4	13.8	13.9	12.9	13.1
Average, 1938–40	13.4	14.0	14.0	13.6	13.6	14.3	13.9	13.4
Mountain:								
1941	21.5	16.7	17.4	15.3	15.6	12.2	10.5	11.3
Average, 1938–40	15.3	13.3	13.5	14.6	14.1	14.3	11.3	14.2
West North Central:								
1941	15.0	13.1	13.9	14.1	14.1	13.8	14.0	12.2
Average, 1938–40	13.4	13.2	12.8	13.6	13.7	13.3	13.5	13.4
West South Central:								
1941	17.9	15.8	16.2	15.6	14.0	13.8	14.5	13.6
Average, 1938–40	15.4	14.0	14.5	15.0	16.5	15.4	15.6	15.1
East South Central:								
1941	14.0	16.2	18.3	17.3	17.8	14.3	14.9	13.7
Average, 1938–40	16.1	15.5	14.5	18.6	16.6	16.0	15.4	13.8
East North Central:								
1941	11.1	11.9	11.3	12.6	12.4	13.1	12.5	11.8
Average, 1938–40	11.6	12.1	11.4	11.2	11.9	11.8	12.2	12.5
Middle Atlantic:								
1941	11.7	12.6	12.6	13.8	13.4	14.8	13.5	12.4
Average, 1938–40	12.7	12.4	12.5	12.8	12.9	13.1	12.7	12.5
South Atlantic:								
1941	13.0	14.9	14.4	16.0	17.3	14.8	15.1	13.3
Average, 1938–40	14.6	14.5	14.4	14.0	16.5	15.4	14.8	15.1
New England:								
1941	14.8	16.4	19.8	20.8	18.0	16.1	15.4	13.8
Average, 1938–40	13.6	15.1	13.5	14.8	14.6	14.3	13.9	14.5

[1] Based on data received from the Bureau of the Census.

Measles.—The number of cases of measles increased from approximately 40,000 during the week ended January 25 to approximately 73,000 during the week ended February 22. An increase in this disease is expected at this season of the year but the present increase is considerably above the normal expectancy. The current incidence compares with 21,999, 53,546, and 134,607 cases for the corresponding period in 1940, 1939, and 1938, respectively. In 1935, another year in which measles was unusually prevalent, the cases for this period totaled approximately 92,000. The highest incidence was reported from the Middle Atlantic, East North Central, South Atlantic, and East South Central regions, the increases ranging from about twice the 1936–40 median figure for the period in the South Atlantic region to more than 9 times the median incidence in the East North Central region. In the New England, West North Central, Mountain, and Pacific regions the incidence is relatively low.

Poliomyelitis.—The number of cases (101) of poliomyelitis was slightly less than the number reported for the corresponding period in 1940, but it was about 25 percent above the seasonal expectancy. The disease was most prevalent in the East North Central and South Atlantic regions, the incidence in those regions being the highest recorded for this period in recent years.

Whooping cough.—The incidence of whooping cough (16,349 cases) was about 40 percent above that recorded for the corresponding period in 1940 and slightly above the 1936–40 median incidence for this period. The greatest excesses over the normal seasonal incidence were reported from the North Central, South Atlantic, West South Central, and Pacific regions.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended February 22 there were 1,171 cases of diphtheria reported, as compared with 1,565, 1,994, and 2,435 for the corresponding period in 1940, 1939, and 1938, respectively. For the country as a whole the incidence is the lowest on record for this period. In the Mountain region the number of cases was slightly above the seasonal expectancy, but in all other regions the incidence was relatively low.

Meningococcus meningitis.—The number of cases (188) of meningococcus meningitis was slightly above the number reported for the corresponding period in 1940, but it was only about 50 percent of the 1936–40 median figure for this period. Increases over last year were reported from the New England, South Atlantic, and South Central areas, but in all regions except the New England the incidence was below the average seasonal incidence.

Scarlet fever.—The incidence of scarlet fever was also relatively low, the total reported cases being only about 70 percent of the number

reported for the corresponding period in 1940, and less than 60 percent of the 1936–40 median figure for the period. All regions of the country shared in this favorable situation except the East South Central and South Atlantic regions; in the East South Central region the number of cases represented an excess of about 40 percent over the average for preceding years, while in the South Atlantic region the incidence stood at approximately the normal seasonal level.

TABLE 2.—*Number of reported cases of 9 communicable diseases in the United States during the 4-week period January 26–February 22, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40*

	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,171	1,565	2,069	146,496	71,176	28,549	72,972	21,999	28,868
New England	7	23	39	1,712	57	76	2,433	3,191	5,160
Middle Atlantic	191	265	387	5,152	285	287	29,698	1,688	5,818
East North Central	195	304	411	7,383	8,912	5,016	24,059	2,067	2,067
West North Central	106	104	168	6,558	833	836	1,932	3,724	3,724
South Atlantic	190	266	397	74,515	22,527	9,184	7,041	1,519	3,600
East South Central	107	125	173	18,018	5,571	3,630	2,975	812	812
West South Central	194	286	299	23,945	26,225	5,299	1,708	1,334	1,646
Mountain	98	77	77	4,473	1,528	1,170	1,319	1,860	1,860
Pacific	83	115	138	4,740	5,238	5,238	1,807	5,804	5,801
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	188	178	378	101	109	80	13,812	19,277	21,290
New England	13	2	12	2	3	2	771	1,050	1,585
Middle Atlantic	29	51	60	8	12	7	3,824	6,038	6,038
East North Central	13	10	38	22	20	9	4,571	6,368	8,659
West North Central	12	19	28	12	10	7	1,282	1,796	3,765
South Atlantic	45	36	79	24	14	17	1,051	1,127	1,034
East South Central	43	22	92	7	12	14	853	735	615
West South Central	22	16	38	11	13	9	350	439	654
Mountain	3	12	12	5	6	4	430	734	857
Pacific	8	10	16	10	19	16	680	990	1,315
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	188	257	1,220	247	292	390	16,349	11,677	[3] 15,898
New England	0	0	0	12	24	14	1,256	1,152	1,152
Middle Atlantic	0	0	0	29	46	53	2,982	3,325	3,768
East North Central	72	47	196	29	44	46	3,151	2,070	2,179
West North Central	77	102	413	15	20	20	1,120	477	569
South Atlantic	0	3	5	45	46	74	2,940	1,423	2,347
East South Central	5	13	13	30	20	42	673	436	436
West South Central	16	14	36	46	50	77	1,536	572	572
Mountain	17	67	126	20	14	16	864	1,290	702
Pacific	1	11	95	21	28	28	1,827	932	932

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] 3-year (1938–40) median.

Smallpox.—Smallpox again reached a new low level. For the 4 weeks ended February 22 there were 188 cases reported, as compared with 257, 1,554, and 2,241 cases for the corresponding period in 1940, 1939, and 1938, respectively.

Typhoid fever.—There were 247 cases of typhoid fever reported for the current 4-week period, the lowest number recorded for this period in the 13 years for which these data are available. The situation was favorable in practically all sections of the country.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended February 22, based on data received from the Bureau of the Census, was 13.6 per 1,000 inhabitants (annual basis). The rate for the corresponding period in 1940 was 13.2, and the average rate for the years 1938–40 was 13.3. A further discussion of these rates is found under the subject of influenza.

ALCOHOLISM AND PUBLIC HEALTH[1]

By LAWRENCE KOLB, *Assistant Surgeon General, United States Public Health Service*

Alcoholism is a problem that gives concern to practically all countries with the so-called western civilization. Probably no country has reason to pay more attention to it than the United States and apparently none has achieved less satisfaction from measures designed to combat it. It is a matter of public concern whose health features have been obscured by social and legal factors inseparable from a problem whose central theme is closely bound, on the one hand, to the profit motive and, on the other hand, to poverty, delinquency, and crime.

Alcohol has therapeutic and food values and is harmless when appropriately used in medical practice for these values. It becomes a health problem through its use as a beverage and because of its intoxicating properties and its power to enslave certain types of persons. Such persons, becoming so enslaved, indulge to excess and suffer physical, social, and mental deterioration thereby. These facts are brought about partly by the direct effect of alcohol and partly by factors associated with its excessive use.

There are no accurate statistics covering all phases of the alcohol problem; consequently its extent is not accurately known. The best statistics available are those dealing with admissions to hospitals for mental disease of patients suffering with alcoholic psychosis, and with deaths due to alcoholism; but it is not known what proportion of chronic alcoholics become psychotic or what proportion of excessive drinkers so obviously die from the effects of alcohol that their deaths

[1] Read at the meeting of the American Association for the Advancement of Science, held in Philadelphia from December 27, 1940, to January 2, 1941, as a part of the Symposium on Alcoholism sponsored by the Research Council on Problems of Alcohol, and published in the Quarterly Journal of Studies on Alcohol, vol. 1, No. 4 (March 1941). Reprinted here by permission of the Quarterly Journal of Studies on Alcohol.

are attributed to alcoholism. Admissions for acute alcoholism to hospitals in certain cities and arrests throughout the country for drunkenness and disorderly conduct, a condition often associated with drunkenness, give additional information as to the extent of that type of drinking which leads to exposure, neglect, and disease. The association of alcohol with crimes more serious than drunkenness also throws some light on the picture, but our knowledge of this subject is very incomplete.

ADMISSION RATES IN HOSPITALS FOR MENTAL DISEASE

Alcoholic psychoses accounted for 4.5 percent of all first admissions to hospitals for mental disease in the United States in 1938. An additional 6.9 percent were patients suffering with alcoholism without psychosis. There was a higher percentage of first admissions only for the psychoses associated with the aged (cerebral arteriosclerosis and senility) and the so-called functional psychoses (manic depressive psychosis and dementia praecox). The admissions due to syphilis exceeded those due to alcoholic psychoses, but were exceeded by admissions due to the combined causes of alcoholic psychoses and alcoholism without psychosis. Patients admitted to hospitals for mental disease with the diagnosis of alcoholism without psychosis are as a rule suffering with an extreme grade of chronic alcoholism. The admission rate for alcoholism with psychosis was 3.7 per 100,000 for the total population in 1938. The rate for 1922, the first year for which rates for all mental hospitals are available, was 2.5 per 100,000. In 1933, the first year of prohibition repeal, the rate was 3.7. It rose to 4.4 in 1937 and has since declined slightly. The trend of the rates of admission of patients for alcoholism without psychosis corresponds with the rates for those with psychosis (table 1).

TABLE 1.—*First admission rates for alcoholism with and without psychosis to all institutions for mental disease in the United States, 1922, 1933–1939*

Year	Alcoholism (with psychosis)		Alcoholism (without psychosis)	
	Number of patients	Rate per 100,000 of the total population	Number of patients	Rate per 100,000 of the total population
1922	2,693	2.5	(2)	
1933	4,651	3.7	4,202	3.4
1934	4,762	3.8	6,271	5.0
1935	4,883	3.8	6,487	5.1
1936	5,274	4.1	7,813	6.1
1937	5,639	4.4	8,458	6.6
1938	4,913	3.7	7,575	5.8
1939	4,773	3.6	7,458	5.7

[1] Data are available for State hospitals only during the years 1923–1932.
[2] Data are not available for categoric breakdown of first admissions without psychosis.

Source: "Patients in Hospitals for Mental Disease," Bureau of the Census, U. S. Department of Commerce, 1922, 1933–1938.

First admission rates of various geographic regions for the year 1938 are shown in table 2. The differences shown for the different areas for that year are approximately the same as for other years. The New England States, with a rate of 6.6, had the highest admission rate of any region for patients with alcoholic mental disease, and the Mountain and East South Central States, with a rate of 1.4, had the lowest. The regional rates for patients with psychosis are influenced, to a certain extent, by the availability of hospital beds. The Pacific States, with a rate of 13.1, had the highest rate of admissions for alcoholism without psychosis, and the West South Central States, with a rate of 2.6, had the lowest rate. The rates of admission for alcoholism without psychosis are influenced greatly by local practices in the handling of chronic alcoholics, and they cannot be interpreted as an accurate measure of the relative prevalence of alcoholism in the various regions.

TABLE 2.—*First admission rates for alcoholism with and without psychosis to all institutions for mental disease by region, 1938*

Region	Alcoholism (with psychosis)		Alcoholism (without psychosis)	
	Number of patients	Rate per 100,000 of the total population	Number of patients	Rate per 100,000 of the total population
United States	4,913	3.7	7,575	5.8
New England	561	6.6	424	5.0
Middle Atlantic	1,405	5.1	981	3.6
East North Central	1,115	4.2	1,443	5.4
West North Central	325	2.4	745	5.5
South Atlantic	494	2.8	1,678	9.4
East South Central	155	1.4	566	5.3
West South Central	238	1.8	339	2.6
Mountain	58	1.4	127	3.1
Pacific	562	5.8	1,272	13.1

Source: "Patients in Hospitals for Mental Disease," Bureau of the Census, U. S. Department of Commerce, 1938.

DEATH RATES FOR ALCOHOLISM

Death rates for alcoholism have been available for the expanding registration area of the United States since 1910. In that year the rate was 5.4 per 100,000. The highest recorded rate, 5.9, was in 1913. It declined from 5.2 in 1917 to 1.0 in 1920, then gradually rose to 4.5 in 1927 and 1928, since which time the trend has again been downward. The rate has been influenced to some extent from time to time by the addition of new States to the death registration area, in most of which the rates were lower than in the registration area as a whole. In 1927, with 42 States and the District of Columbia in the death registration area, the rate was 3.7. The rates have varied in different parts of the country. The Middle Atlantic States and most of the New England States have consistently had high rates. There was a decided drop in rates in all regional areas during the period of effective prohibition, 1919–21. From 1910 to 1918 Montana had a higher rate

than any other State. Nevada came into the registration area in 1929 and has had the highest rate every year since then except in 1933. The South Atlantic, South Central, and Plains States have had lower rates than the rest of the country. The rates in Kansas have been consistently low. Kansas came into the registration area in 1914 and has had a lower rate than any other State in seven of the succeeding years and shared the low rate one other year. South Carolina had the lowest rate for seven years. Other States that have had the lowest rate for a year or more are North Carolina, Mississippi, Alabama, Louisiana, North Dakota, South Dakota, and Utah. States having the lowest

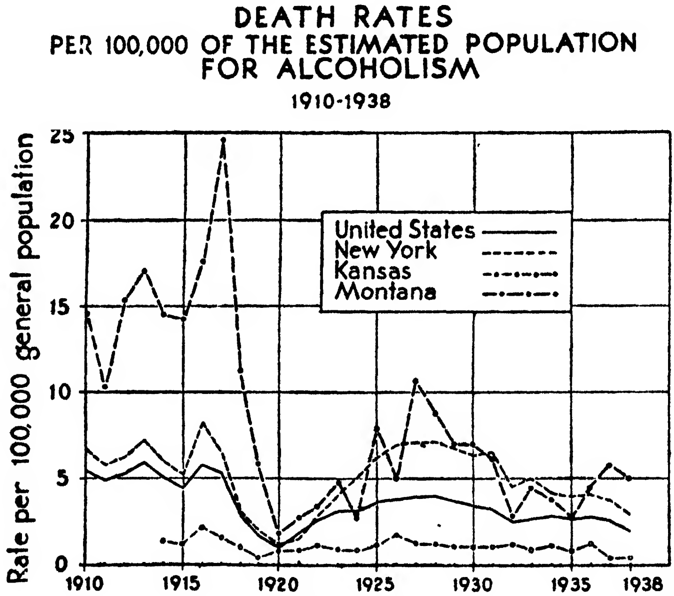

FIGURE 1.

rates before Kansas came into the registration area are Maine (once) and Kentucky (three times). The States that later on were shown to have low rates were not reporting at that time. As a rule, low rates correspond to restrictions on the sale of liquor and the preponderance of rural population, but for some unexplained reason the highly rural States of Montana and Nevada have had the highest rates.

Various factors associated with the first World War and growing restrictions on the manufacture and sale of liquor caused a drop in the rates for deaths from alcoholism in 1918 in every State except Washington. The rates continued to fall in practically all States until 1920 and then began to rise. The rate in Montana dropped from 24.6 in 1917 to 1.8 in 1920, but rose to 10.7 by 1927. Montana had Statewide prohibition from 1919 to 1926, but the rate nevertheless rose to 7.6 in 1925. Figure 1 shows the alcoholic death rates for the United States, New York, Montana, and Kansas, for the period 1910 to 1938.

Kansas had State-wide prohibition during the entire period. The rates for the Nation as a whole have not materially changed since the repeal of prohibition in 1933. The rate for 1938, 2.0, is the lowest since 1921.

It is well known that the number of recorded deaths due to alcoholism is much lower than the actual number due to this cause. Out of consideration for the families and friends of deceased alcoholic patients, physicians are inclined to record deaths as due to some other cause whenever possible. In spite of this tendency, the figures as given for 1937 show that alcohol caused more deaths than any one of 31 infectious diseases, some of which were formerly veritable scourges. No accurate statistics are available for deaths due to diseases in which alcohol was a contributing factor or for suicides, homicides, and accidental deaths due to alcohol.

In spite of wide areas of prohibition in the United States, the recorded alcoholic death rates were higher here from 1910 to 1930 than in the British Isles, the Scandinavian countries, Holland, or Belgium. Possible explanations are that there is more leisure to drink and more money to buy liquor in the United States than in those countries and higher taxes on spirituous liquor abroad. It is also possible that in filling out death certificates European physicians are even more inclined than ours to spare the feelings of relatives.

In some places in the United States ethyl alcohol may be bought over the counter of drug stores without a physician's prescription. Under this liberal policy the drunkard, with only a few cents in his pocket, can buy enough alcohol to stupefy himself. That he takes advantage of the opportunity afforded him is shown by the fact that in Boston the death rate from alcoholism in 1939 was 16.4 per 100,000, as compared with 4.5 in New York, where a physician's prescription is needed (table 6).

ARRESTS FOR DRUNKENNESS

Arrests for drunkenness are a source of information as to the extent of alcoholism, but local policies as to arrests vary so greatly throughout the country that regional figures are not comparable and definite conclusions cannot be drawn from the available statistics. It is not known what proportion of the persons arrested in any given region are chronic alcoholics or are likely to become so because of innate susceptibility and associated social factors. Nor is it known what proportion of alcoholics who get conspicuously drunk escape arrest in a given year. In 1939, in a group of 1,214 cities with an aggregate population of 39,147,097, there was a total of 634,006 persons arrested and held for prosecution, because of intoxication or of driving while intoxicated (table 3). An additional 159,417 were held for prosecution for disorderly conduct, much of which was doubtless due to drinking. This

does not express the entire figure, because in 872 of these same cities with a population of 23,955,440 there were 74,075 persons arrested for drunkenness and for driving while drunk and 7,784 arrested for disorderly conduct, none of whom were held for prosecution (table 4). Doubtless some of these people were innocent of the charge, but the figures as given are significant.

TABLE 3.—*Persons charged (held for prosecution) with drunkenness, driving while drunk, and disorderly conduct, 1939 (1,214 cities, total population 39,147,097)*

Offense charged	Number charged and rate
Drunkenness.	
Number of persons charged	592,510
Rate per 100,000 of population	1,513 5
Driving while intoxicated.	
Number of persons charged	41,496
Rate per 100,000 of population	106 0
Disorderly conduct:	
Number of persons charged	159,417
Rate per 100,000 of population	407 2

Source: Uniform Crime Reports, Volume XI, No. 1, Federal Bureau of Investigation, U. S. Department of Justice

TABLE 4.—*Persons released without being held for prosecution for drunkenness, driving while drunk, and disorderly conduct, 1939 (872 cities, total population 23,955,440)*

Offense	Number and rate
Drunkenness.	
Number of persons released	73,435
Rate per 100,000 of population	303 5
Driving while intoxicated	
Number of persons released	640
Rate per 100,000 of population	2 7
Disorderly conduct:	
Number of persons released	7,784
Rate per 100,000 of population	32 5

Source Uniform Crime Reports, Volume XI, No. 1, Federal Bureau of Investigation, U. S Department of Justice

The arrest rates for drunkenness and associated offenses (table 5) vary widely in different regions of the country. The differences probably represent local practices as to arrests rather than the relative amount of drunkenness. This is seen by comparing the arrest rates with the death rates of individual States comprising those regions. The South Atlantic States have an arrest rate three times as high as the Middle Atlantic States, but their death rates[2] are in the aggregate lower. Other inconsistencies occur. From the incomplete figures that are given, the inference is drawn that there is a more liberal policy as to arrests in the Middle Atlantic and East North Central States than in other parts of the country.

Differences in local practices as to arrests are shown more strikingly by comparing the arrests for alcoholism and alcoholic death rates in

[2] Bureau of the Census, Vital Statistics—Special Reports, vol. 9, No 64, pp. 857–864.

New York City, Boston, Baltimore, Philadelphia, and Washington, D. C. (table 6). The alcoholic death rates for Baltimore and Philadelphia were lower than those for New York for each of the years 1935–39, and the rates for Washington, D. C., were lower for each year except 1937, when it was the same; but arrests for drunkenness were from 27 to 47 times higher in Washington, from 14 to 31 times higher in Philadelphia, and from 3 to 6 times higher in Baltimore than in New York. Boston has had the highest rates for both deaths and arrests. Its alcoholic death rates for the 6-year period were from 3 to 4 times higher than those for New York, but its arrest rates have been from 46 to 89 times higher.

TABLE 5.—*Persons charged (held for prosecution) with drunkenness, driving while intoxicated, and disorderly conduct, in 1,214 cities, by geographic regions, 1939*

[Population estimated as of July 1, 1933, by the Bureau of the Census]

Geographic region	Number of cities	Population	Offense charged: Drunkenness		Driving while intoxicated		Disorderly conduct	
			Number	Rate per 100,000 of total population	Number	Rate per 100,000 of total population	Number	Rate per 100,000 of total population
New England	119	4,542,057	95,503	2,102.7	3,496	77.0	3,937	86
Middle Atlantic	325	7,914,277	78,645	993 7	3,281	41.5	28,704	362.
East North Central	317	13,824,006	136,800	989 6	12,796	92 6	36,643	265
West North Central	148	4,171,763	52,006	1,246 6	4,035	96 7	15,370	368.
South Atlantic	65	2,700,503	86,381	3,198.7	6,050	224 0	42,505	1,574.
East South Central	19	462,775	13,485	2,913 9	907	196 0	3,427	740
West South Central	54	2,413,013	57,371	2,377 6	2,058	85.3	18,944	785
Mountain	45	726,741	13,416	1,846 0	1,130	155.5	4,031	554
Pacific	122	2,391,962	58,900	2,462.4	7,743	323 7	5,850	244.

Source: Uniform Crime Reports, First Quarterly Bulletin, 1940, Volume XI, No. 1, Federal Bureau of Investigation, U. S. Department of Justice.

TABLE 6.—*Arrests for alcoholic intoxication and deaths resulting from alcoholism in selected cities, 1935–39*

Year	Arrests for alcoholic intoxication,[1] rate per 100,000 of population					Deaths from alcoholism,[2] rate per 100,000 of population				
	Baltimore	Boston	New York	Philadelphia	Washington, D. C.	Baltimore	Boston	New York	Philadelphia	Washington, D. C.
1935	358.9	5,148.2	86.3	2,700.7	3,899.5	3.1	17.0	6.0	3.5	4.4
1936	350.8	5,259.6	79.8	2,422.8	3,222.5	2.9	15.6	6.2	3.1	6.1
1937	390.0	5,923.0	66.3	1,902.3	3,105.3	3.7	16.2	5.3	1.9	5.3
1938	327.0	5,293.9	98.3	1,761.1	2,904.3	2.6	15.7	4.3	2.5	3.3
1939	330.7	5,171.0	111.9	1,608.0	2,987.0	1.9	16.4	4.5	2.4	3.9

[1] Information furnished by the police departments of the respective cities shown.
[2] Information furnished by the health departments of the respective cities shown.

HOSPITALIZATION FOR ALCOHOLIC POISONING

An idea of the prevalence of serious disabling alcoholism may be had from a study of patients hospitalized for alcoholic poisoning in some

of the large cities. This is especially true where patients urgently in need of attention are treated in hospitals rather than in jails. The hospital figures from two cities, New York and Washington, D. C., are illuminating. A comprehensive study of the prevalence of alcoholism, as revealed by hospital treatment, is presented in the work of the Research Bureau of the Welfare Council of New York City.[3] Studying the records of all discharges from 113 municipal and voluntary hospitals in the city in 1933, but omitting State hospitals, it was found that 15,576, or 2.7 percent, of the total number of patients discharged were diagnosed as suffering from alcoholic poisoning. Of this number, 10,527 (67 percent) were reported with the single diagnosis of alcoholism. The remainder were reported as also suffering from various complicating conditions, such as fracture, brain trauma, stab or gunshot wound, superficial injuries, and other or unspecified conditions. Of the total alcoholic patients, 1,355 (8.7 percent) were readmitted to the same hospital during the year, making 14,221 different alcoholic patients discharged during the year. It is possible that a few of these were not chronic alcoholics; but if we accept the number as accurate and apply the same rate to the country as a whole, there would have been 252,361 chronic alcoholics in the United States during that year. There are, of course, several errors in any such assumption. In the first place, all the chronic alcoholics would not be treated in any one year, and, in the second place, the New York figures would not necessarily apply to the country as a whole. Most of the chronic alcoholics treated at public expense in New York are treated at Bellevue Hospital, and those in Washington at Gallinger Municipal Hospital (table 7).

TABLE 7.—*Alcoholic admissions to Bellevue Hospital (New York) and Gallinger Municipal Hospital (Washington, D. C.), 1935–39*

Year	Bellevue Hospital[1]		Gallinger Municipal Hospital[2]	
	Number	Rate per 100,000 of population	Number	Rate per 100,000 of population
1935	9,148	127.2	1,246	211.8
1936	11,956	165.3	1,407	232.2
1937	11,393	156.5	1,233	197.8
1938	12,084	165.0	1,208	188.4
1939	12,019	163.1	1,347	204.5

[1] Information furnished by Dr. Norman Jolliffe, Bellevue Hospital.
[2] Information furnished by the Superintendent, Gallinger Municipal Hospital.

In 1933, when the special study was made in New York by the Welfare Council, there were 9,542 alcoholic admissions to Bellevue Hospital. In 1939 there were 12,019 admissions, giving a rate of 163.1 per 100,000 population of New York City. In 1939 there were 1,347

[3] Fraenkel, Marta: Hospitalized patients with alcohol poisoning. Quart. J. of Studies on Alcohol, 1: 246 (1940).

alcoholic admissions to Gallinger Municipal Hospital, Washington, giving a rate of 204.5 per 100,000 population. Figures for readmissions to Gallinger are not available, but the readmissions during any given year are probably offset by patients treated elsewhere. If we apply the Gallinger rate to the country as a whole we have, for the United States, 268,043 patients urgently in need of treatment for alcoholic poisoning during the year. However, the objections to accepting the Bellevue Hospital rate for the entire country apply with equal force to the Gallinger rate.

On the basis of the Washington figures, the incidence of alcoholism does not differ greatly between white and colored persons. The high percentage of alcoholism in Washington is certainly not due to its large Negro population. In 1930, 27.7 percent of the population were Negroes (1940 census figures not yet available). In 1939, 30.1 percent of arrests for drunkenness were Negroes. That this indication of a slightly higher proportion of drunkenness among Negroes is due to other factors than drunkenness is indicated by the fact that, in this same year, only 19 percent of persons who died in Washington from alcoholism were Negroes and only 19.2 percent of those admitted to Gallinger Municipal Hospital for alcoholism were Negroes.

CRIME

Crimes due to alcohol are of medical as well as legal and social significance, and they indicate to some extent the prevalence of serious alcoholism. The relation between alcoholism and crime has not been given the thorough study that it deserves. The most notable work on the subject was that done by the Committee of Fifty.[4] Studying 13,402 convictions in 17 prisons and reformatories in 12 States in 1893, the Committee concluded that intemperance figured as one of the causes of crime in 50 percent of the cases and was the sole cause in 16.87 percent. Judge Joseph T. Zottoli, of the Municipal Court of Boston, using a less direct method than that followed by the Committee of Fifty, has made an exhaustive study of the relation between alcoholism and crime in Massachusetts. In a personal communication he states that more than 90 percent of the adult population of prisons in Massachusetts, to which prisoners are sent for misdemeanors, are there because of offenses caused by drunkenness, and that about 50 percent of persons receiving sentences to penal institutions have committed offenses related to alcoholism.

While the figures given for insanity, deaths, hospitalization, arrests, and crimes due to alcoholism, are inadequate to serve as the basis for definite conclusions as to the extent of serious alcoholism in the United States, it would appear safe to assume from them that there are at least 200,000 persons in the country whom alcohol has completely

[4] Emerson, Haven: Alcohol and Man. The Macmillan Company, New York, 1932. Page 315.

mastered, that is, who are chronic alcoholics, or persons who cannot, or will not, control their drinking and who, as a result, have become serious problems to themselves, to their families, and to the community. It also may be safely assumed that at any one time there are in the country 1,000,000 or more persons who, because of excessive indulgence and special susceptibility, are in danger of becoming chronic alcoholics. It is not possible to make even a reasonable estimate of the number of additional persons who are exposing themselves to accidents, disease, and social hazards because of overindulgence in alcohol. The total picture is, however, a large one that deserves the serious attention of health officers as well as social planners in general.

Alcoholism is largely a health problem, but it cannot be divorced from its social and legal features. The whole subject should be approached with a broad viewpoint that admits at once that alcohol is both harmful and useful.

Man seems to be incurably afflicted with a desire to get, by artificial means, more pleasure out of life than it normally gives him. He likes to escape from unpleasant conditions and to have some means of acting childishly without being aware of it. Alcohol is the least harmful of any of the drugs by which he can achieve these results. It affords all grades of relief, from mild and pleasant relaxation after a hard day's work to euphoria that expresses itself by complete and boisterous irresponsibility.

Since complete suppression of the use of alcohol as a beverage has been shown to be impossible, and is probably undesirable, it behooves us to devise means to protect the susceptible and to help the victims of it insofar as this can be done.

In order to approach the problem rationally, it is desirable to have more accurate information about all of its phases, so that better methods of prevention and cure can be devised. Comprehensive studies should be made in order to acquire accurate knowledge as to the prevalence and social consequences of alcoholism, including crimes due to it, and of alcoholic deaths. Such studies will require the cooperation of health officers, peace officers, welfare workers, and hospital executives. A survey should be made of the treatment facilities and the effects on the alcoholic of various methods of handling him. Above all, we need to know more about the fundamental causes of alcoholism and the nature of the physical and mental changes that make users more and more susceptible and less amenable to treatment. The psychologist, the psychiatrist, the internist, and the laboratorian all have a place in this field. In the meantime, we should do the best we can with the knowledge that we have.

The fact that the ratio of male to female alcoholics is six or seven to one clearly indicates that in the majority of instances something besides susceptibility produces chronic alcoholism. The difference is

doubtless due to social customs and the general attitude as to what is right and wrong for the two sexes. There is here a strong suggestion as to the desirability of education about the effects of alcohol that would have as one of its objectives the building up of a public conscience that, by social pressure, would discourage excesses in either sex.

STATE CONTROL

Certain measures of regulation concerning liquor control are also necessary. This is recognized and the various States have adopted different measures that are more or less effective, but which in many cases could doubtless be improved. Two States have complete prohibition, two have prohibition of all liquor save beer, some have State monopolies, some have prohibition and local dispensaries, and there are regulations as to places and time of sale, but in some of the States the control measures seem to be designed more to regulate business than to discourage excessive drinking. Local option is allowed in 34 States, and since the repeal of the more or less ineffective national prohibition in 1933, more than 5,000 communities have returned majorities against the further sale of liquor.

CONTROL IN EUROPE

Alcoholism has been decreasing in most of the European countries, as a result of regulations and a growing sentiment for temperance, and this fact is often cited to prove the superiority of European methods of control. The critics of the American system, or systems, fail to take account of one important factor, namely, that the American people have more leisure to drink and more money to buy alcohol than any other people in the world. We have more deaths from alcohol for the same reason that we have more deaths from automobile accidents. Finland and Norway established prohibition following the last World War and abandoned it after a brief trial for much the same reason that the United States did. Various systems of control are used in Europe, including government monopolies, laws regulating the hours of sale, high tax on spirituous liquors, education of the populace as to the effects of alcohol, pass-book systems, and the like. In Germany there is a strong campaign for temperance, bound up partly with the desire to make the nation more efficient. Education as to the effect of alcohol is stressed and cognizance is taken of the fact that ethical reasons can serve as a substantial factor in winning people from its use. There is no absolute prohibition, but chronic alcoholics may be sterilized under the law for the prevention of morbid heredity.

The best known system of control is the Bratt individual control system, which was put into effect in Sweden in 1914. Under this system pass books are issued to one member of each family, if he has

income sufficient to warrant the purchase of alcoholic beverages. The book must be presented when he buys liquor, and the quantity purchased is recorded by stamp. There is a limit on the quantity that may be purchased, and the book may be withdrawn, temporarily or permanently, for such offenses as drunkenness, reselling purchased liquor, etc. The system does not apply to beer and wine. The maximum amount of spirits purchased per month must not exceed four liters, but on special occasions extra allowances may be granted. The system does not affect the "on" consumption of spirits, but it is stated that from 80 to 90 percent of spirits consumed in Sweden are consumed at home. There is a high degree of cooperation between the public and the officials in the enforcement of the Bratt system, and its introduction was followed by a sharp reduction in the consumption of spirituous liquors and of cases of drunkenness brought before the courts.

The fact that a system of control seems to work in a country with a homogeneous population like Sweden does not necessarily mean that it would be effective in the United States. A system that requires so much cooperation between officials and the public would probably merely afford another avenue for graft in some sections of our own country. The system is also decidedly less effective than systems in effect in some of the States. It has not abolished alcoholism in Sweden. Between 1921 and 1936 the average number of cases of drunkenness brought before the courts in Sweden [5] was about 30,000. In 1936 the rate per 100,000 was 489.3. The rate of arrests for alcoholism in New York City and Baltimore (table 6) during the same year was 79.8 and 350.8, respectively. The Swedish rate is six times the New York rate, in spite of the fact that two-thirds of the Swedish people live in rural communities. However, during the same year the Boston rate was eleven times the Swedish rate, so all that can be derived from these figures is that New York has gotten farther away than other places from the rather backward idea that drunkenness is of itself a crime.

PROVISIONS FOR TREATMENT

The provision for treatment of acute and chronic alcoholism is inadequate in practically all parts of the United States. The drunkard is, in many places, arrested and placed in jail until he sobers up. He may then receive a fine or an additional sentence of a few more days in jail. In most cases the procedure is not only useless but harmful, in that the atmosphere of jails tends to dissipate ethical resistance to drunkenness and to other social lapses. In many large cities public hospitals treat the acute alcoholic for a few days and do a good job of it insofar as the immediate attack is concerned.

[5] Statistic Arsbok for Sverige, 1940.

Some of the States provide for the commitment and treatment of nonpsychotic alcoholics in State hospitals, and such patients are admitted, to a certain extent, to the State hospitals in all States, but in most cases they are not welcome and only a few get in. Several States accept voluntary patients. California and Virginia make more use of their State hospitals for the treatment of nonpsychotic alcoholics than any other State. The laws pertaining to admission provide for admission for a period of 4 months to 2 years. One State provides for commitment not to exceed 12 months, except in the case of dipsomaniacs, who may be committed for 3 years. In actual practice, alcoholics committed to State hospitals are kept from 1 to 12 months, most cases being discharged within 6 months. Provision for the treatment of alcoholics in State hospitals affords some relief for a few extreme cases, but leaves without assistance of any kind that large number of chronic alcoholics who need treatment but have no means of securing it because of lack of funds. Many of these people could be saved if, in the early stage of their chronic alcoholism, they were handled like sick people instead of being treated like criminals or allowed to shift for themselves.

There should be a system of hospitals to which such patients would be admitted on a commitment or voluntary basis, but it would be useless to erect such buildings and then operate them as prisons. They should give the best of medical attention, including outdoor work, and all the activities that go to make up an institution designed to rehabilitate the patients. Punishment beyond that implied in the restraint incident to commitment should have no place in the scheme of treatment. Success in treatment depends largely upon long periods of abstinence, during which the patient learns to adjust himself to difficulties without drink while he is acquiring a different viewpoint and a new set of habits that tend to carry him away from instead of toward temptation after he has been discharged. This can never be accomplished if he is merely confined and treated with neglect, indifference, and hostility, as is the case in so many jails and public hospitals where alcoholic patients are now treated.

The building and proper management of hospitals for chronic alcoholics is probably too much to expect of the smaller States. The ideal solution would be for the Federal Government to assist the larger States with hospitals that would be operated solely by the States, but with such supervision by the Federal Government as would be implied by financial aid. The Federal Government might well build and operate several hospitals for the treatment of voluntary patients from any part of the country. Additional legislation, perhaps beyond the constitutional power of Congress to enact, would be necessary for the Government to treat and hold against their wills cases

committed from different States; hence the necessity for the States to take individual action. Hospitals for alcoholics could well be operated on the same plan as that of the two Federal hospitals for narcotic addicts. These hospitals have tended to take sin and punishment out of narcotic addiction and to place treatment, rehabilitation, and research in the foreground. They have had success beyond expectations, and hospitals for alcoholics operated in the same manner would doubtless also prove worthwhile, both from the treatment and economic standpoints. There should be a follow-up system to bolster the morale of the discharged patients and give psychiatric advice. This should be combined with educational work and the formation of private welfare centers such as have proved so successful in handling drunkards in Switzerland.

In conclusion, alcoholism is a large problem that is poorly handled in many parts of this country by health, welfare, and police agencies. There are needed more comprehensive statistics, more extensive facilities for treatment, a wide dissemination of facts, control measures designed to prevent excesses, and, above all, research into all phases of the subject so that facts may be uncovered that will lead to effective measures of prevention and cure.

HOSPITALS EXISTING SINGLY IN COUNTIES HAVE SIMILAR FINANCIAL STRUCTURE [1]

By Joseph W. Mountin, *Senior Surgeon,* Elliott H. Pennell, *Statistician,* and Kay Pearson, *United States Public Health Service*

In the United States there are about 900 small hospitals each of which represents the only registered community facility for general or allied special service available in the county where it is situated.[2] No matter whether these hospitals are controlled by local governments, nonprofit associations, or proprietary agencies, their financial structure is much the same. Regardless of their bed capacity, their geographic location, or the characteristics of the county in which they are located, their financial structure is still of fairly similar pattern. What the pattern is and how it compares with the one descriptive of all hospitals of corresponding classification will be presented in this report.

[1] From the Division of Public Health Methods, National Institute of Health. Study conducted in connection with the National Health Inventory, assistance in the preparation of these materials having been furnished by the personnel of Work Projects Administration Official Project Number 712159-658/9999.

[2] From tabulations of data contained in the Journal of the American Medical Association, vol. 106, No. 10, March 7, 1936. The term "registered" applies to hospitals approved by the American Medical Association. "Special" service, as used here, is that obtained in hospitals furnishing types of care which are closely identified with general medical and surgical service. Hospitals furnishing such service include maternity, industrial, isolation, eye-ear-nose-throat, orthopedic, children's, and others offering similar specialized types of care. Mental and tuberculosis hospitals are not included.

The hospitals under discussion must be clearly distinguished. It has been said that they represent within their counties the only registered community facilities for general or allied special service. There may be in the same county mental and tuberculosis hospitals, but these are of course definitely circumscribed as to range of service. Occasionally an infirmary unit of an institution, which by nature of its organization restricts its benefits to wards of the institution, may also be located within the county. Possibly, even, there are other general or allied special[3] hospitals which for specific reasons are disregarded in this study. Either they are controlled by Federal or State agencies and thus do not represent true community accommodations, or they are not approved for registration by the American Medical Association. Although some of the nonregistered hospitals are probably of considerable importance in meeting definite community needs, they are not included here since information regarding them is so fragmentary that dependable representation of the group cannot be assured. The group selected for analysis is composed, then, of registered county, city, nonprofit, and proprietary hospitals which offer general or particular medical and surgical services, and which of themselves exist without duplicate in a county. For brevity, they will be designated as "single" hospitals, even though the term is not strictly applicable.

From the Business Census of Hospitals conducted by the United States Public Health Service during 1935 were obtained data relative to the financial organization of hospitals.[4] According to information published by the American Medical Association, there has been but slight change in number of hospitals from 1935 to 1939 and only a moderate expansion in total number of beds.[5] It is reasonable to say that the financial structure of hospitals during the year 1935 continues to describe very closely the structure in existence today. Extractions from data secured by means of the hospital survey provide the foundation for this study. The coverage of the entire Census was fairly comprehensive, more than four-fifths of the beds contained in registered general and special hospitals having been included in the schedules submitted during the survey. Reporting was less complete, however, for small than for large hospitals, with the result that the single ones, usually very small, are not so fully represented as is the

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[3] See footnote 2.

[4] Reports based on the Business Census of Hospitals which contain material related to that presented in this study are listed below:

(a) Pennell, Elliot H., Mountin, Joseph W., and Pearson, Kay: Business Census of Hospitals, 1935. General Report. Supplement No. 154 to the Public Health Reports, U. S. Government Printing Office, 1939.

(b) Pennell, Elliot H., Mountin, Joseph W., and Pearson, Kay: Existence and use of hospital facilities among the several States in relation to wealth as expressed by per capita income. Public Health Reports, Vol. 55, No. 19, May 10, 1940.

(c) Pennell, Elliot H., Mountin, Joseph W., and Pearson Kay: Financial support of hospitals controlled by State and local governments. Public Health Reports, Vol. 56, No. 10, March 7, 1941.

[5] Journal of the American Medical Association, Vol. 114, No 13, March 30, 1940.

entire group. Nevertheless, the sample used herein is thought to be adequate as it includes more than one-half of the registered hospitals existing singly and they in turn contain approximately two-thirds of the aggregrate beds. It is weighted somewhat with facilities under the supervision of governmental and nonprofit agencies, since replies from institutions so controlled were comparatively more numerous than were those from places under proprietary control.

The sample just described excludes 17 reporting hospitals, most of them nonprofit institutions, which are located alone in counties definitely metropolitan in character. As the existence of these hospitals represents an atypical situation, it was felt that a discussion of community facilities that are frequently the only readily accessible ones would be more to the purpose if these institutions were omitted. Each of them is situated in a county that is part of a large population center where there are numerous hospital facilities.

In this analysis, agency in control serves as a constant base for classification. County governments, city governments, and the two in combination constitute the local official agencies that provide means for hospitalization. Churches, fraternal orders, and similar groups not organized on a profit-sharing basis make up the nonprofit classification. Individuals, partnerships, and profit-sharing corporations compose the proprietary agencies engaged in hospital operation. One-seventh of the hospitals existing alone which reported in the Census are controlled by local governments, about one-half by nonprofit organizations, and the remainder, slightly more than one-third, by proprietary agencies. Distribution of beds in reporting hospitals differs slightly from the distribution of institutions. Nonprofit hospitals contain two-thirds of all beds reported, thereby proving themselves above average in size; and proprietary ones contain little more than one-fifth of the beds reported, thus proving themselves of relatively small capacity. The proportion of beds maintained by local governments equals the proportion of hospitals so maintained.

As supplements to the discussion which follows, one chart and five tables are included in the text. In each, it will be noted that the agency controlling the institution constitutes, as stated earlier, the primary classification of hospitals for an analysis of their means of support. Throughout the several investigations, sources of income used for operating purposes are designated as "patients," "taxes," and "other." All sums received from patients, both bed and ambulatory, constitute the first-named source. Government appropriations, emergency and otherwise, except those devoted to plant improvement, are classified as income from taxes. In the source denoted "other" are included earnings from endowments, donations from charitable organizations, and miscellaneous receipts. Both the chart and the tables permit comparison of the financial set-up of particular classes of

hospitals taken as a whole with that of corresponding classes of hospitals which exist alone in counties. It is recognized that in some instances the composition of the corresponding classes is probably such that they are not strictly comparable, as, for example, the composition of certain size categories; however, there is beyond doubt sufficient resemblance among the groups of like classification that effective comparison may be made.

Earlier articles have given evidence that in many instances a large part of the burden of support for local governmental hospitals is borne directly by patients.[6] The cardinal point revealed by this study—that city and county hospitals existing singly are supported in practically the same manner as are voluntary hospitals—confirms in greater detail the evidence already produced. Figure 1 and table 1 emphasize the parallelism in plans of support which prevails among governmental, nonprofit, and proprietary hospitals existing alone. Also they reveal the striking dissimilarity between the financial schemes of governmental hospitals in the aggregate and of those of single existence. According to previously established figures,[7] governmental hospitals controlled by local agencies receive 14 percent of their revenue from patients and 84 percent from taxes. In extraordinary contrast, the group of these hospitals which exist alone obtains 76 percent from patients and 21 percent from taxes—practically a reversal of proportions. The slight fraction from miscellaneous sources is nearly the same for each group.

TABLE 1.—*Percentage distribution of income by source for all registered general and special[1] hospitals of specified control, and for hospitals of like classification existing singly in counties*

Control of hospital	Percentage of income from specified source							
	All hospitals				Hospitals existing singly in counties			
	Total	Patients	Taxes	Other	Total	Patients	Taxes	Other
Local governments	100 0	14.4	83.6	2 0	100.0	76 1	21.4	2 5
Nonprofit agencies	100 0	70.9	10.3	18.8	100 0	80 9	8 3	10 8
Proprietary agencies	100 0	91.4	4.2	4 4	100 0	90.4	6 2	3.4

[1] "Special" hospitals, as used here, are hospitals furnishing types of care which are closely identified with general medical and surgical service These hospitals include maternity, industrial, isolation, eye-ear-nose-throat, orthopedic, children's, and others offering similar specialized types of care. Mental and tuberculosis hospitals are not included.

If singleness of existence completely recasts the plan of support for governmental hospitals, what changes may be expected among voluntary hospitals, which are of course chiefly patient-supported? Need for hospitalization of persons in straitened circumstances might neces-

[6] Plumley, Margaret Lovell: Organization and Financial Policy of City and County Hospitals. Transactions of the American Hospital Association, Forty-First Annual Convention, 1939, vol. 41, p. 470. See also footnote 4.

[7] See footnote 4 (c).

sitate governmental subsidization of single nonprofit or proprietary hospitals to the point that proportions of revenue from taxes would be appreciably raised. Such possibility is denied by the findings reproduced in the chart and table 1. Actually, the percentage of income originating from patients rises from 71 percent for all nonprofit hospitals to 81 percent for the members of the group that are situated singly. The proportion from taxes shows small decline for the single

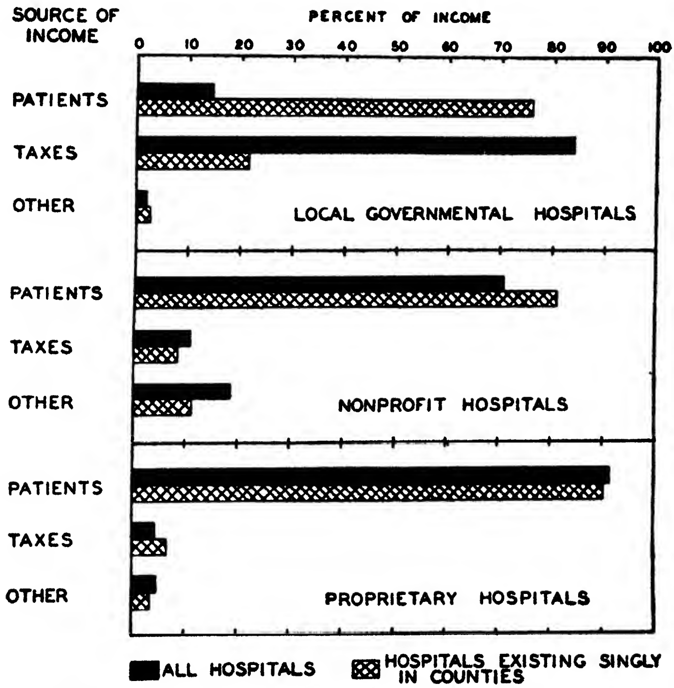

FIGURE 1.—Percentage distribution of income by source for all registered general and special hospitals of specified control, and for hospitals of like classification existing singly in counties.

institutions. Nonprofit hospitals in the aggregate draw almost one-fifth of their income from miscellaneous sources; those existing apart from others draw only one-tenth from such sources. The scheme of support for single hospitals under proprietary control coincides so closely with that for the whole rank of proprietary hospitals that differentiation is pointless. It is sufficient to say that more than nine-tenths of the revenue for each of the two groups is supplied by patients.

With this comparison completed, it may be well to review the percentages in order to stress the similarity of financial structure characterizing single hospitals. While the percentages expressing income from patients for all hospitals vary from 14 to 91 for the 3 control groups,

those descriptive of single hospitals range only from 76 to 90. Spans in the percentages stating income from tax funds are comparable to those just described. There is, of course, less divergence among the smaller percentages showing income from other sources. By way of summary, the financial structure of single hospitals under the three separate controls may be thus outlined: At least three-fourths of all receipts for each control group are derived from patients; a maximum of one-fifth comes through the channel of government appropriations; and not more than approximately one-tenth for any group is obtained from other sources.

Examination of the financial structure of hospitals representing the sole community facility was not limited to each control group taken as a whole. In order to determine the influence of certain characteristics, both of the hospital and of the community containing it, on means of support, several detailed types of investigation were undertaken. First, single hospitals of the three control groups were classified according to bed capacity and then analyzed as to origin of income; later, the same analysis was made of the three control categories classified according to certain external factors such as geographic location, and population and metropolitan character of counties wherein these hospitals are situated. Certain of the findings are supplied in tables 2 to 5. It may be repeated that data are also provided in the tables which continue the comparison between the financial set-up of single hospitals and that of hospitals in the aggregate.

As stated earlier, single institutions are of small capacity, averaging less than 40 beds each. For convenience of discussion, these hospitals are divided into three groups—less than 25 beds, 25 to 49 beds, and 50 to 149 beds. The three single hospitals exceeding a capacity of 149 are omitted from the study concerning size. The classes thus formed are in the main comparable with preestablished ones covering all hospitals. According to table 2, single hospitals of official control show no consistent trend in relation to changing bed capacity, inasmuch as the middle-sized group receives relatively more income from patients and less from taxes than does either of the other size groups. Of particular interest is the fact that single hospitals of small capacity which are controlled by local governments receive from patients the same percentage of their receipts as do all hospitals of similar size and control. Among larger hospitals the ratios stating income by source are divergent for institutions occurring singly and for those occurring both in multiple and singly. Hospitals existing alone which have a bed capacity of 25 or more receive a notably larger fraction of their income from patients than do the aggregate hospitals of like size.

TABLE 2.—*Percentage distribution of income by source for all registered general and special*[1] *hospitals of specified control and bed capacity, and for hospitals of like classification existing singly in counties*

Control and bed capacity of hospital	Percentage of income from specified source							
	All hospitals				Hospitals existing singly in counties			
	Total	Patients	Taxes	Othe	Total	Patients	Taxes	Other
Local governments:								
Less than 25	100 0	65.7	31.0	3.3	100.0	65.3	34.2	0.5
25 to 49	100 0	68.1	28 4	3 5	100.0	80.1	18.0	1.9
50 to 149 [2]	100 0	45.9	52.0	2.1	100.0	73.5	22.5	4 0
Nonprofit agencies:								
Less than 25	100.0	67.5	6.9	25.6	100.0	75.0	9.4	15 6
25 to 49	100.0	69.4	8.5	22.1	100 0	80.0	9.9	10.1
50 to 149 [2]	100.0	74.2	9.2	16.6	100.0	81.3	7.9	10.8
Proprietary agencies:								
Less than 25	100.0	91.5	4.2	4.3	100 0	86 1	6.8	7.1
25 to 49	100.0	90.5	4.0	5.5	100 0	90.9	7 1	2.0
50 to 149 [2]	100.0	91.5	4.3	4.2	100 0	96.2	3.4	.4

[1] "Special" hospitals, as used here, are hospitals furnishing types of care which are closely identified with general medical and surgical service. These hospitals include maternity, industrial, isolation, eye-ear-nose-throat, orthopedic, children's, and others offering similar specialized types of care. Mental and tuberculosis hospitals are not included.

[2] The size interval "50 to 149" is used in order to facilitate comparison of hospitals of similar size, percentages describing all hospitals having previously been obtained for this interval. The three single hospitals which exceed a bed capacity of 150 are omitted from this particular analysis.

Little variation in sources of revenue occurs among the different size groups of single nonprofit hospitals. The smallest draw 75 percent from patients, the medium-sized ones 80 percent, and the largest 81 percent. Without exception these percentages are appreciably higher than those describing matching composite groups. Proprietary hospitals existing alone, like nonprofit hospitals of similar situation, show small increase in proportions of revenue from patients as bed capacity is expanded. The percentages range from 86 to 96. Remarkable congruity prevails in the financial set-up of proprietary hospitals occurring singly and of proprietary hospitals in mass. From these findings the obvious deduction concerning each control group is that the internal factor of size is but loosely associated with variations in means of support for single hospitals.

For the investigation of the possible weight of external factors on plans of support, hospitals of each control classification were, as an initial step, divided into four groups on the basis of their geographic location. Natural boundaries as well as economic conformity of States entered into the establishment of the four areas [3] which have

[3] The estimated population of each area as of July 1, 1935, and the States included in each are as follows:

Northeastern (38,261,000): Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia.

Southern (37,576,000): Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

Central (39,300,000): Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

Western (12,384,000): Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.

been used in the analysis of data from the Hospital Census. All States, including the District of Columbia, which lie above the Potomac River and east of the State of Ohio constitute the Northeastern area. The region lying below the Potomac and Ohio Rivers and extending as far west as New Mexico is considered Southern. The block of States beginning with Ohio on the east, which is situated almost directly above the Southern area, makes up the Central region. The Western comprises all States from the first mountainous tier to the Pacific coast.

In regard to scheme of support, hospitals representing the sole community facility exhibit from area to area rather pronounced differences. Hospitals in the Western region, with only 56 percent of their income from patients, represent the lower extreme among local governmental institutions; those in Central States, with 83 percent from patients, represent the upper limit. Inequalities also prevail in the percentages from taxes, with a low of 14 for the South and a high of 44 for the West. Only minute fractions of the revenue for governmental hospitals are derived from miscellaneous sources except in the South where one-tenth is so obtained. The gulf is wide between single and aggregate hospitals controlled by local governments. In each area, the proportion secured from patients is decidedly greater and the proportion from taxes decidedly smaller for single hospitals than for the entire group.

TABLE 3.—*Percentage distribution of income by source for all registered general and special [1] hospitals of specified control and location,[2] and for hospitals of like classification existing singly in counties*

Control and location of hospital	Percentage of income from specified source							
	All hospitals				Hospitals existing singly in counties			
	Total	Patients	Taxes	Other	Total	Patients	Taxes	Other
Local governments:								
Northeastern	100.0	9.9	87.7	2.4	100.0	70.7	28.9	0.4
Southern	100.0	33.4	60.9	5.7	100.0	76.7	14.2	9.1
Central	100.0	22.0	77.1	.9	100.0	83.1	15.3	1.6
Western	100.0	5.9	93.1	1.0	100.0	56.2	43.8	[3]
Nonprofit agencies:								
Northeastern	100.0	61.7	14.8	23.5	100.0	73.6	10.0	16.4
Southern	100.0	78.0	6.0	16.0	100.0	77.7	7.2	15.1
Central	100.0	80.5	6.3	13.2	100.0	86.8	8.1	5.1
Western	100.0	82.6	3.4	14.0	100.0	85.6	7.2	7.2
Proprietary agencies:								
Northeastern	100.0	86.9	5.8	7.3	[4] 100.0	[4] 51.1	[4] 11.6	[4] 37.3
Southern	100.0	95.3	2.2	2.5	100.0	94.2	3.5	2.3
Central	100.0	87.1	7.8	5.1	100.0	88.6	9.6	1.8
Western	100.0	95.0	1.9	3.1	100.0	88.5	6.1	5.4

[1] "Special" hospitals, as used here, are hospitals furnishing types of care which are closely identified with general medical and surgical service. These hospitals include maternity, industrial, isolation, eye-ear-nose-throat, orthopedic, children's, and others offering similar specialized types of care. Mental and tuberculosis hospitals are not included.
[2] See footnote 8 in text.
[3] Less than 0.05 percent.
[4] Representing only 3 hospitals.

Again, this time in the case o single nonprofit institutions, it is the Central region in which the largest proportion of revenue comes directly from patients. The West is a close second. The lowest proportion from payments by patients distinguishes the Northeast. The percentages derived from taxes are similarly small in the separate areas. In Northeastern and Southern States, hospitals acquire somewhat larger fractions of their income from miscellaneous sources than they do in Central and Western States. Between single hospitals and the all-embracing group, resemblance is close. In each area except the Southern, the percentage of income derived by single hospitals from fees of patients exceeds in small degree the percentage so secured by the complete group; the proportions from taxes are almost equal; and the relative sums from other sources are slightly less for single institutions than for those considered in total.

As there are too few single hospitals of proprietary control in the Northeast to justify statistical treatment, that area is excluded from the immediately following discussion. In the other three areas, patients supply 89 percent or more of the receipts for proprietary hospitals. It follows that the sums from taxes and other sources are rather small. If it were possible to superimpose the financial design of single proprietary hospitals on that for proprietary hospitals taken together (excluding, of course, the Northeast), only a few minor deviations could be perceived.

From the foregoing facts, it is obvious that among single hospitals of the three control groups subdivided according to geographic location of the institution no sequence in plan of financial support can be discovered. Fluctuations are not sufficiently great, however, to belie the general statement that hospitals existing alone are alike in financial structure.

The concluding analyses of hospitals existing singly are concerned with the relationship between sources of income and certain attributes of the county containing the hospital. When counties maintaining only one general or special hospital were divided on a population base, almost nine-tenths of them were found to contain fewer than 40,000 inhabitants. The other one-tenth fell in the population interval of 40,000 to 99,999, an interval established for earlier analyses. As may be seen in table 4, county and city hospitals in the smaller counties obtain from individual fees 75 percent of their receipts and from taxes 23 percent; those in the larger counties secure from fees 88 percent and from taxes but 8 percent. The rest of the income, that from unspecified sources, amounts in each instance to less than 5 percent. For nonprofit and proprietary hospitals, location on the basis of county population does not appreciably alter schemes of support. Only among institutions subject to local governments is there marked differentiation between single hospitals and the total group so con-

trolled. Here, even, the difference is not so pronounced for hospitals in the smaller counties as for those in the larger ones.

TABLE 4.—*Percentage distribution of income by source for all registered general and special*[1] *hospitals of specified control in counties of different population range, and for hospitals of like classification existing singly in counties*

Control of hospital and population of county	Percentage of income from specified source							
	All hospitals				Hospitals existing singly in counties			
	Total	Patients	Taxes	Other	Total	Patients	Taxes	Other
Local governments:								
Less than 40,000	100.0	65.7	31.8	2.5	100.0	74.6	23.2	2.2
40,000 to 99,999 [2]	100.0	44.9	50.5	4.6	100.0	87.6	7.5	4.9
Nonprofit agencies:								
Less than 40,000	100.0	79.3	7.7	13.0	100.0	80.3	8.2	11.5
40,000 to 99,999 [2]	100.0	77.0	8.1	14.9	100.0	82.5	8.4	9.1
Proprietary agencies:								
Less than 40,000	100.0	92.1	4.2	3.7	100.0	90.6	6.3	3.1
40,000 to 99,999 [2]	100.0	91.6	4.1	4.3	100.0	87.6	5.4	7.0

[1] "Special" hospitals, as used here, are hospitals furnishing types of care which are closely identified with general medical and surgical service. These hospitals include maternity, industrial, isolation, eye-ear-nose-throat, orthopedic, children's, and others offering similar specialized types of care. Mental and tuberculosis hospitals are not included.

[2] The population interval "40,000 to 99,999" is used in order to facilitate comparison of hospitals located in counties of similar population range, percentages describing all hospitals having previously been obtained for this interval. No hospitals existing singly in counties, except a few (omitted in this study) found in metropolitan areas, are located in counties exceeding a population of 100,000.

Another attribute of counties which suggests the possibility of alteration in the financial scheme of hospitals is proximity to a metropolitan center. For an investigation of the effect of roughly graded distances from a metropolitan area on the sources of income for single hospitals, counties containing such institutions were classified into four groups: metropolitan, first tier, second tier, and third tier and beyond. The metropolitan character of a county is determined by its location in relation to a metropolitan district as identified by the Bureau of the Census. By definition, such a district has an aggregate population of 100,000 or more and contains a city of at least 50,000 inhabitants. Any county in which more than half the population resides within the limits of these established metropolitan districts is classified as metropolitan. Counties adjoining those which are of metropolitan classification are designated as first tier; those once removed are described as second tier; and the remainder are identified as third tier and beyond.

It will be recalled that the few hospitals located singly in metropolitan counties are discarded from this analysis since they can hardly be considered the only readily accessible facilities. Most of the metropolitan counties that have but one hospital are, in part, suburban areas of large cities which probably contain sufficient facilities so that provision of additional ones in these immediately adjacent counties has not seemed feasible. Furthermore, in such areas, travel for those who need hospital care is easier and probably less expensive than it

is in more out-of-the-way counties; hence the problem of accessibility is reduced.

As might be expected, hospitals located singly are most frequently found in counties that are third tier or beyond. In fact, two-thirds of the reporting hospitals are so located, and the remainder are roughly divided between first- and second-tier counties. Striking uniformity in plan of support characterizes hospitals of similar control located in counties of the several tiers. On an average, single hospitals under the management of local governments received 76 percent of their income from patients (table 1). The component percentages (table 5) reach but from 78 for hospitals in first-tier counties to 75 for those in counties three or more tiers removed. Almost as close agreement prevails among both nonprofit and proprietary hospitals, regardless of their distance from metropolitan districts.

TABLE 5.—*Percentage distribution of income, by source, for all registered general and special*[1] *hospitals of specified control in counties of different metropolitan character,*[2] *and for hospitals of like classification existing singly in counties*

Control of hospital and metropolitan character of county	Percentage of income from specified source							
	All hospitals				Hospitals existing singly in counties			
	Total	Patients	Taxes	Other	Total	Patients	Taxes	Other
Local governments:								
First tier	100.0	42.1	53.1	4.8	100.0	77.6	20.4	2.0
Second tier	100.0	52.0	46.9	1.1	100.0	77.0	22.3	.7
Third tier and beyond	100.0	60.9	33.1	6.0	100.0	74.7	21.6	3.7
Nonprofit agencies:								
First tier	100.0	71.0	9.7	19.3	100.0	75.5	9.4	15.1
Second tier	100.0	80.4	8.2	11.4	100.0	79.0	6.5	14.5
Third tier and beyond	100.0	80.2	7.8	12.0	100.0	83.7	8.5	7.8
Proprietary agencies:								
First tier	100.0	90.7	4.8	4.5	100.0	94.8	4.8	.4
Second tier	100.0	91.8	6.0	2.2	100.0	88.1	6.7	5.2
Third tier and beyond	100.0	91.8	3.5	4.7	100.0	90.0	6.4	3.6

[1] "Special" hospitals, as used here, are hospitals furnishing types of care which are closely identified with general medical and surgical service. These hospitals include maternity, industrial, isolation, eye-ear-nose-throat, orthopedic, children's, and others offering similar specialized types of care. Mental and tuberculosis hospitals are not included.

[2] Counties in which more than half of the population resides in a metropolitan district, as defined by the Bureau of the Census, are considered "metropolitan." Adjoining counties are called "first tier," those once removed "second tier," and the remainder "third tier and beyond." Hospitals existing singly in metropolitan counties are excluded since the circumstances of their existence are somewhat anomalous.

Other community factors, such as wealth and population density, might be used as the basis for further investigation, but the analyses already undertaken are sufficient to demonstrate the consistent resemblance in the financial plans of all hospitals which represent the only registered community facility within the county. Variation in bed capacity is accompanied by almost no change in sources of income. From one geographic region to another there is limited diversity in scheme of support, the chief difference occurring in the Western area. Neither population nor metropolitan character of the encompassing

county appears to alter especially the financial set-up of hospitals. Since each of these factors has previously been shown to be in some measure instrumental in shaping the financial policy of hospitals in the aggregate, their failure to bring about appreciable change in the fiscal plans of single hospitals is of particular interest.

In this study it was found that when hospitals controlled by city or county governments are located singly in counties, they take the financial character of voluntary institutions; that the nonprofit hospitals existing alone are even more completely supported by patients than are total nonprofit hospitals; and that in plan of support the proprietary hospitals are unchanged by singleness of existence. The striking similarity in the financial structure of each control group lies in the fact that these hospitals representing the sole community facility have but one notable source of income—fees collected directly from patients.

What, specifically, are the implications in these findings regarding the means of support for single hospitals? Other reports based on the Business Census of Hospitals, several of which were cited in this study, have pointed out that dependence upon patients for a great measure of support means that the availability of hospitals is considerably lessened. From a review of previous investigations, this is the story which takes form. Rates of occupancy fall lower as proportions of income from patients grow larger. If more than half of the hospital income consists of fees paid by patients, about half of the beds remain unoccupied. The same areas which reveal low occupancy rates among hospitals, that is, those with small populations, with few hospital facilities per person, and with low per capita income, also reveal comparatively few days of hospital care per unit of population. It may be added in this connection that the farther hospitals are removed from metropolitan areas, the greater the extent to which they rely on patients for their upkeep.

Into the outline of that story, single hospitals may be fitted with precision. Such impediments to satisfactory operation are particularly characteristic of hospitals existing alone in counties. Depending upon individual fees for more than three-fourths of their income, they are very poorly occupied. Beyond doubt they care for only a fraction of the persons within range of service who would be benefited by hospitalization. In many instances their distance from population centers, hence from hospital centers, intensifies the need that they be made more generally available within their communities. From each of the foregoing statements the inference is the same. If improvement in possibilities for hospitalization in such areas is to come within a reasonable time, it must come in great part through revision of the prevailing financial organization.

HUMAN RIBOFLAVIN REQUIREMENT ESTIMATED BY URINARY EXCRETION OF SUBJECTS ON CONTROLLED INTAKE [1]

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Studies on the human urinary excretion of riboflavin have been reported by Helmer (*1, 2*), Emmerie (*3, 4, 5*), Roscoe (*6*), Ferrebee (*7*), Spies, Bean, Vilter, and Huff (*8*), and Klein and Kohn (*9*). Emmerie found a daily excretion in men of 819 to 1,250 micrograms and observed increased excretion on increased intake. In one individual after a restricted riboflavin intake the excretion dropped from 650 micrograms to 300 to 400 micrograms daily. Hogan (*10*) has estimated the human riboflavin requirement at 2 to 3 milligrams a day on the basis of Emmerie's data. Ferrebee found that riboflavin excretion in general depended on the riboflavin intake, and the excretion in 5 normal subjects eating their usual diet varied from 700 to 1,700 micrograms per day.

Following the reports on the symptoms of riboflavin deficiency in humans (*11, 12, 13, 14, 15, 16, 17*) it appeared desirable to have additional information on the human requirement for riboflavin. We therefore undertook a riboflavin balance study on 10 women under institutional care. Four of the subjects were receiving the ration of cornmeal, cowpeas, casein, lard, and syrup with suitable supplements which has been previously described in detail by Sebrell and Butler (*13*). Six were receiving a ration similar to that used by Goldberger and Wheeler and reported in detail by Walker and Wheeler (*18*). One of these subjects also received 30 milligrams of nicotinic acid daily, 2 a daily supplement of 5 milligrams of nicotinic acid, and another 1.0 milligram. Another received daily supplements of 3.3 milligrams of thiamine and 30 milligrams of ascorbic acid. Both of the rations are low in riboflavin, and it was determined by assay that they contain approximately 0.5 milligram of riboflavin per 2,400 calories. The average daily dietary intake of riboflavin was calculated for each subject on the basis of the daily food intake. The rations were accurately prepared by a dietitian and the quantity served and left on the plate was calculated for each subject at each meal.

All subjects were depleted for 131 to 254 days during which time the only riboflavin received was that in the ration. Following this depletion period varying amounts of riboflavin were given once daily by mouth.

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[1] From the Division of Chemotherapy, National Institute of Health.

The riboflavin excreted in the urine was determined by the microbiological assay method of Snell and Strong (*19*). When necessary, correction was made for the inhibiting effect of urea on the assay by the method of Isbell, Wooley, and Fraser (*20*).

Twenty-four hour urine specimens were collected and transferred to brown bottles kept in the refrigerator. The quantity was measured, and the urine made acid to congo red paper with concentrated sulfuric acid. An aliquot was placed in a small brown bottle, heated on a water bath for 30 minutes and shipped to the laboratory (usually 48 to 72 hours en route). Specimens were then kept in the refrigerator until assayed. Assays were made from 1 to 14 days after collection except in certain instances when repetitions of the assays were necessary. Control assays showed no appreciable loss of riboflavin in urine in a month's time under these conditions of collection and preservation.

As controls, 7 consecutive daily determinations of the riboflavin content of the urine of 3 women and 2 consecutive daily determinations on the urine of 4 women on an institution diet gave riboflavin values varying between 130 and 810 micrograms per day with an average daily urinary excretion of 357 micrograms; 21 determinations of the riboflavin content of the urine of 11 men on their usual diets gave values of 234 to 1,740 micrograms per day.

During the depletion period 6 of the 10 subjects (3 on each ration) developed symptoms of ariboflavinosis as manifested by cheilosis with fissures at the angles of the lips. These symptoms appeared between the 89th and 232d days of observation. The remaining 4 subjects showed milder symptoms such as pallor at the angles of the lips, slight denudation of the mucosa of the lips and slight seborrheic changes around the nose at the time riboflavin supplements were started. However, these lesions had not progressed far enough for a diagnosis of ariboflavinosis to be made. The cheilosis completely disappeared while the various riboflavin supplements were being given for the purpose of studying the variations in the urinary excretion level. Two with the mild symptoms which never progressed to fissuring at the angles of the mouth continued to show some of these very slight abnormalities at the end of the study and their significance is questionable. The amounts of riboflavin given and the quantity excreted are shown on the individual charts. During the depletion period the riboflavin excreted in the urine varied from 30 to 168 micrograms per day and the daily average was 77 micrograms. The greatest individual variation during this period was from 44 to 168 micrograms per day. While cheilosis was present in the 6 subjects, and before riboflavin was given, the urinary excretion varied from 24 to 119 micrograms per day with a daily average of 74 micrograms. The individual charts show a close relationship between riboflavin intake and excretion similar to that reported by Emmerie (*4*) and Ferrebee

(7). Following the administration of riboflavin there was a steplike increase in excretion, the rapidity of which depended on the amount given and which finally reached a fairly constant level for that particu-

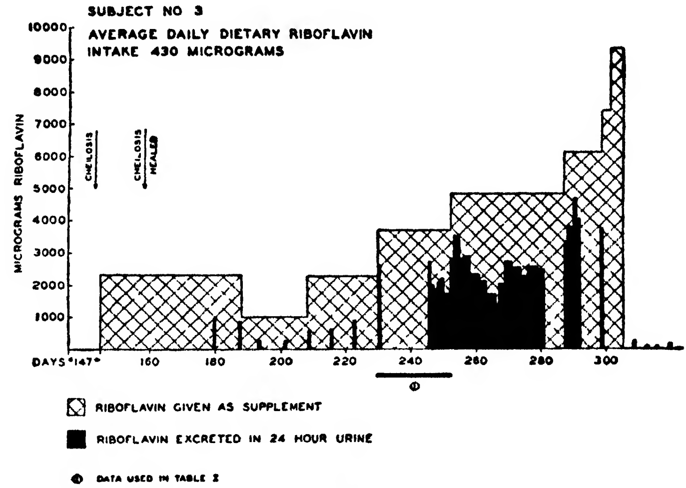

FIGURE 1.

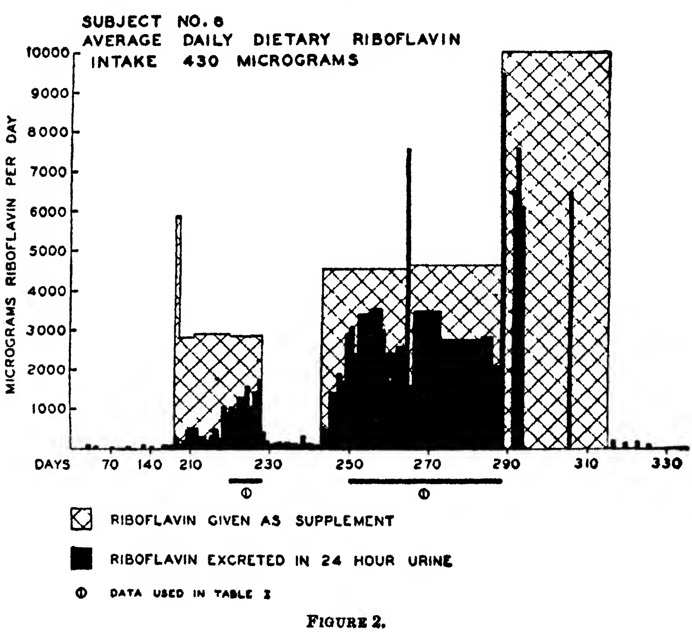

FIGURE 2.

lar amount of riboflavin. Thus subject 46 received a daily supplement of 2 milligrams of riboflavin and the daily urinary excretion rapidly increased from 36 micrograms to 1,484 micrograms in 20 days. On increasing the supplement to 4.2 milligrams the excretion

increased at once and the average daily excretion increased to 3,076 micrograms. The supplement was decreased to 2.2 milligrams and the average daily excretion decreased to 1,265 micrograms. On discon-

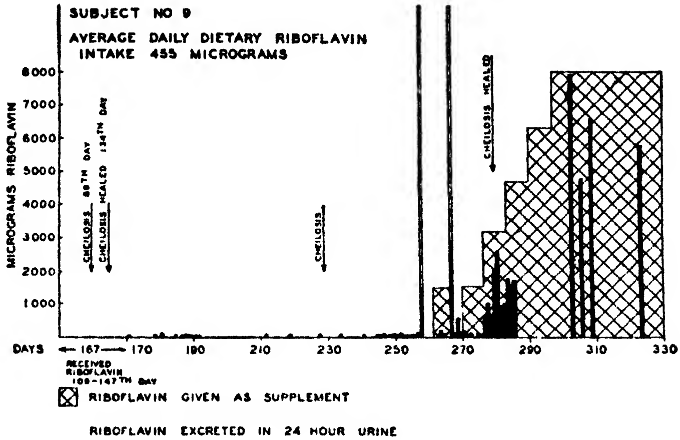

FIGURE 3.

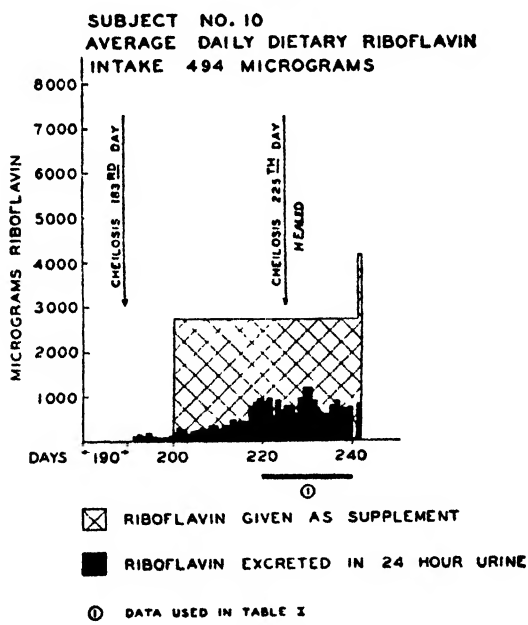

FIGURE 4.

tinuing the riboflavin supplement entirely the daily urinary excretion dropped in 3 days to 173 micrograms and reached a minimum of 79 micrograms per day. On giving a daily supplement of 3.3 milligrams the urinary excretion rapidly increased to an average of 2,433 micrograms per day.

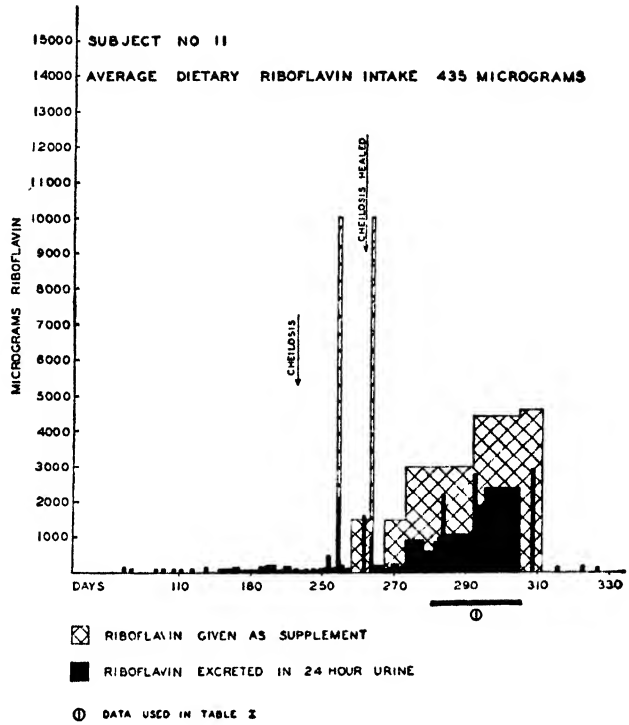

FIGURE 5

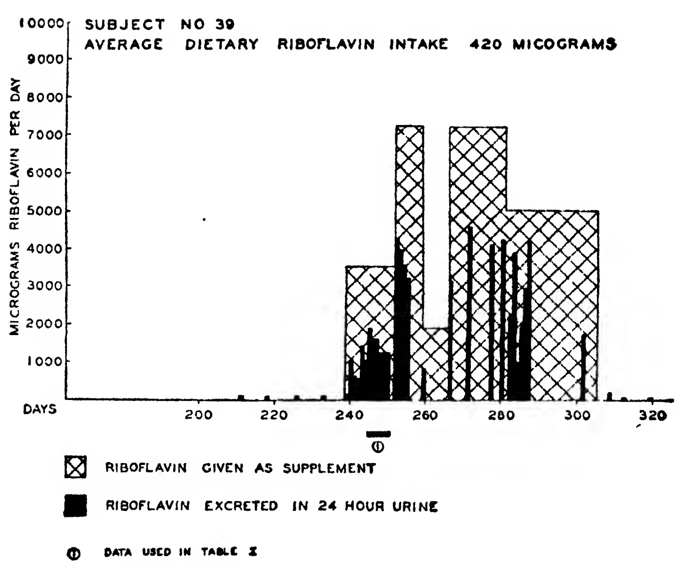

FIGURE 6.

When large amounts of riboflavin were given, such as 5 milligrams per day to subjects 3, 8, and 9, 50 to 80 percent of the amount given

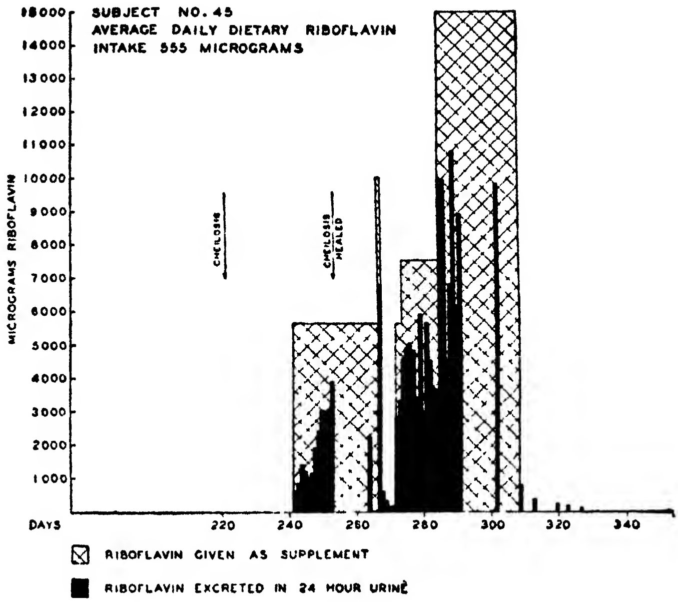

FIGURE 7.

was excreted in the urine. When larger amounts up to 15 milligrams per day were given to subjects 45 and 59 the total quantity excreted in the urine increased but the percentage did not change appreciably.

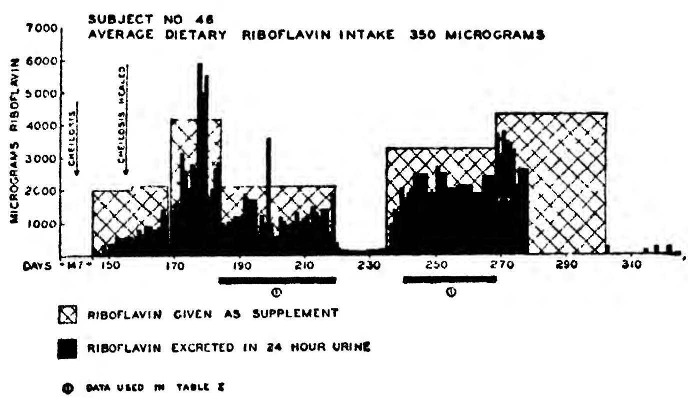

FIGURE 8.

In an effort to calculate the human daily requirement for riboflavin, data are summarized in table 1 from the individual charts. These data show the riboflavin excretion and the riboflavin unaccounted for by urinary excretion during selected periods of riboflavin administration

following the disappearance of the symptoms of ariboflavinosis, and during which the urinary excretion has become fairly constant on a given supplement during 11 periods for eight subjects. The amount of riboflavin unaccounted for by urinary excretion in each subject at the various levels of riboflavin dosage is shown in figure 11. This chart shows a significant increase in the riboflavin unaccounted for between 0.085 and 0.11 milligram (supplement plus diet) per kilogram of body weight. Thus when subjects 3 and 39 were receiving 0.085 milligram

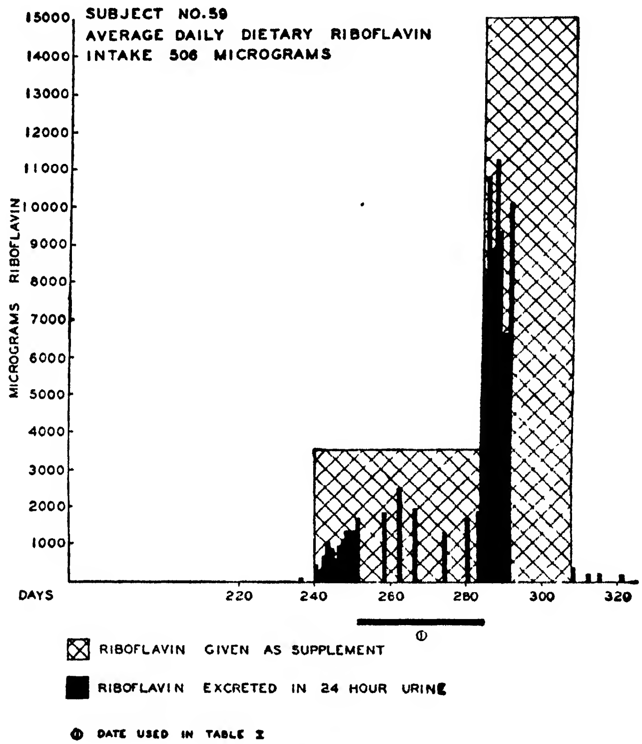

FIGURE 9.

(supplement plus diet) of riboflavin per kilogram of body weight daily, the amount unaccounted for by urinary excretion was 40.5 and 53.0 micrograms per kilogram of body weight per day. On increasing the daily supplement to 0.11 milligram (supplement plus diet) per kilogram of body weight the amount unaccounted for by urinary excretion became 58.5 and 73.0 micrograms per kilogram of body weight, respectively. This suggests that with the larger doses a greater amount of riboflavin is either being destroyed or is not absorbed, and that 0.085 milligram per kilogram of body weight (supplement plus diet) is probably an intake greater than that needed for riboflavin saturation.

TABLE 1.—*Riboflavin intake and execretion*

Subject No.	Weight	Period, days	Average riboflavin intake in diet	Supplement of riboflavin, per day	Total riboflavin intake	Average riboflavin excreted in urine in 24 hours	Riboflavin unaccounted for in urine	Riboflavin not accounted for per kilo body weight
	Kilograms		*Micrograms*	*Micrograms*	*Micrograms*	*Micrograms*	*Micrograms*	*Micrograms*
3	47 4	232-252	430	3,640	4,070	2,151	1,919	40.5
8	61.3	220-227	525	2,830	3,355	1,210	2,145	35
8	61.3	250-288	525	4,500	5,125	2,779	2,246	37
10	56.3	220-240	494	2,750	3,244	793	2,451	43.5
11	59 5	280-292	465	2,950	3,415	975	2,440	41
11	59.5	293-305	465	4,600	5,065	2,424	2,641	44 5
39	49.2	245-252	420	3,610	4,030	1,410	2,620	53 0
46	42 8	189-214	433	2,200	2,633	1,265	1,368	32
46	42.8	271-280	358	3,300	3,658	2,433	1,225	28
59	48.6	252-284	556	3,470	4,026	1,848	2,178	45
65	47	250-281	530	3,510	4,040	2,179	1,861	40

When supplements of 0.025 milligram (plus 0.01 milligram in the basal diet) of riboflavin per kilogram of body weight (1.56 to 2.05

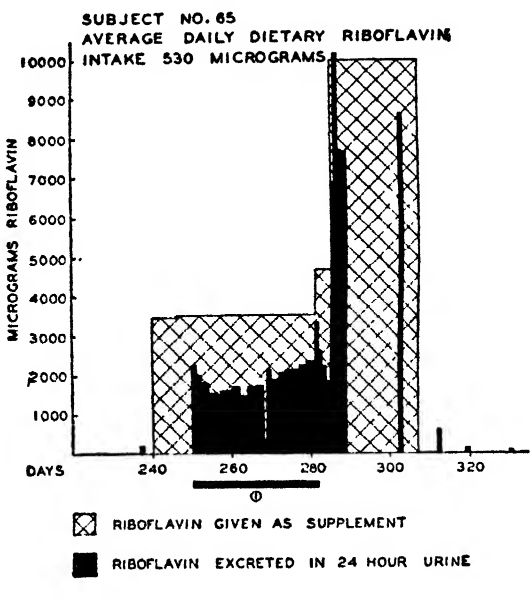

FIGURE 10.

milligram total) were given, the average urinary excretion ranged from 140 to 186 micrograms per day. These figures are lower than the average for the women on the institution diet (357 micrograms). When supplements of 0.05 milligram (plus 0.01 milligram in the basal

diet) per kilogram of body weight (2.54 to 3.68 milligram total) were given, the average urinary excretion varied from 793 to 1,265 micrograms per day, which is higher than the average amount excreted by the women on the institution diet and is within the normal range for men as reported by Emmerie (*4*) and Ferrebee (*7*).

Because of the exceptionally large increase in daily urinary excretion which occurred when the 0.05 milligram per kilogram supplement was given, it appears that this amount (in addition to the riboflavin in the basal ration) is probably above the normal requirement while

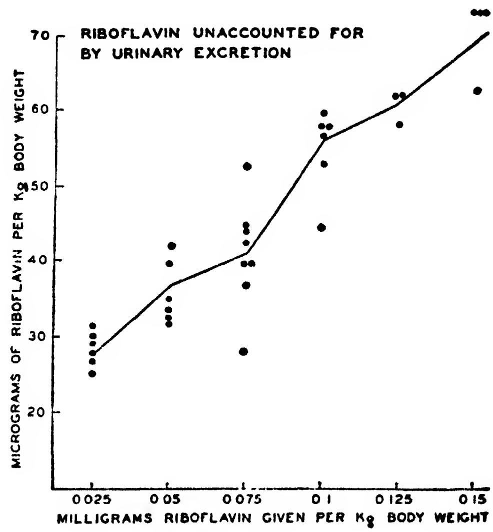

FIGURE 11.

the 0.025 milligram per kilogram dose is marginal or below the normal requirement.

Sebrell and Butler (*12*) also noted that a supplement of 0.025 milligram per kilogram of body weight was an insufficient amount in the treatment of some cases of ariboflavinosis.

The above lines of evidence indicate that 0.035 milligram of riboflavin per kilogram of body weight is not quite enough to meet the adult requirement and 0.06 milligram per kilogram of body weight is slightly above the required amount.

On this basis the daily requirement of an adult would be approximately 3 milligrams.

CONCLUSIONS

Seven women on an institution diet excreted an average of 357 micrograms of riboflavin daily in the urine.

Ten women on rations containing approximately 0.5 milligram of riboflavin per 2,400 calories excreted an average of 77 micrograms of riboflavin daily in the urine.

Data are presented on the urinary excretion of riboflavin which indicate that a daily intake of 3 milligrams is sufficient for an adult.

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BENZENE (BENZOL): ITS TOXICITY AND POTENTIAL DANGERS

Prepared by the DIVISION OF INDUSTRIAL HYGIENE, *National Institute of Health, United States Public Health Service*

Benzene (benzol) is a toxic material and should not be confused with benzine, a mixture mainly of aliphatic hydrocarbons. In acute poisoning it acts predominantly as a nerve poison, causing depression of the central nervous system; in subacute and chronic poisoning it

causes, in addition, damage of the blood, the blood-forming organs, and the blood vessels.

Physical-Chemical Properties of Benzene.

Benzene, C_6H_6, has a molecular weight of 78.11 and a specific gravity of 0.879 at $\frac{20°}{4°}$ C. It is a colorless liquid which solidifies at 5.5° C. and boils at 79.7° C. It is soluble in water to the extent of 0.06 parts per hundred at 20° C. and mixes freely with alcohol and ether. Commercial benzene is seldom pure and may be contaminated with xylene, toluene, phenol, thiophene, carbon disulfide, acetonitrile, pyridine, and other substances (*1*). Chemically pure benzene has a flash point of −12° to +10° C. The ignition temperature at atmospheric pressure in air is 490° C. and the lower limit for inflammability in percent by volume of vapor in air at atmospheric pressure and ordinary temperature is 1.4, whereas the upper limit is 8 percent (the upper limit not being definitely established). For commercial 90's benzol the lower limit of inflammability is 1.5 percent and the upper limit 9.5 percent (the upper limit not being definitely established). Ignition may be caused by open flames or sparks from electrical appliances.

Maximal Permissible Concentration of Benzene.

The maximal allowable concentration of benzene (benzol) is at present accepted as 100 parts per million [1] by volume of air (corresponding to 0.32 milligram per liter at 25° C. and 760 mm. Hg) for exposures not exceeding a total of 8 hours daily.

Sources of Exposure to Benzene.

Benzene is used very extensively in a large number of industries.

In the *chemical industry* it is prepared by distillation of coal and coal tar and it is used for the extraction of oils and fats, in the synthesis of organic chemicals such as dyes and their intermediates, in the manufacturing of varnishes, lacquers, stains, and paints, and it is a constituent of certain paint and varnish removers. It is also used in the manufacture of linoleum and celluloid. Hazards of exposure exist also in the manufacture of other plastics and in the blending of motor fuel.

In the *rubber industry* and in many other industries it is used in certain rubber cements; a potential hazard may exist in the manufacture of rubber tires and other rubber articles, straw hats, cardboard boxes, waterproof goods, and in many other trades where this type of cement is used. The same holds true for the *artificial leather industry* where

[1] This figure for the maximal permissible concentration of benzene has been accepted and published by the American Standards Association in its Standards on Allowable Concentrations of Toxic Dusts and Gases —Z37.4—1941. Copies of this standard may be obtained from the American Standards Association, 29 West Thirty-ninth Street, New York City.

it is used with other chemicals as a solvent for nitrocellulose before this is applied to the fabric.

In the *dry cleaning industry* it played a very important role prior to the introduction of chlorinated hydrocarbons for this purpose.

In *intaglio printing establishments* it is used as a cleaning agent for the forms.

Determination of Benzene in Air.

For the determination of benzene in air, samples should be taken wherever there is a known or suspected source of benzene vapors and they should be collected at the breathing level of the workers exposed, especial emphasis being given to the locations nearest the source and those in the path of the air currents carrying the vapors. They should be taken at sufficient intervals of time so that any variations in concentration will be evident, and in sufficient number to avoid any reasonable doubt of the results found. If only one sampling point is deemed necessary, samples should be taken in triplicate, but if numerous locations are to be sampled, representative points may be selected among them.

Benzene may be determined in air by passing it through a nitrating mixture and subsequent distillation with steam of the dinitrobenzene formed. After neutralization of the acid solution the dinitrobenzene may be determined titrimetrically by means of titanous chloride or colorimetrically (Smyth, 1931) (*2*) or according to the procedure of Schrenk, Pearce, and Yant (1935) (*3*).

Benzene may also be determined by its adsorption on activated charcoal after acids and moisture have been removed by proper filters, but since this method is not specific it may be used only when no other organic solvents are present in the air. Owing to the size of the adsorption tubes, a similar tube should be used for a counterbalance when weighing (*5*, *15*).

It has also been suggested that benzene and other organic solvents be first condensed in a container surrounded by dry ice and later the benzene be removed by distillation and oxidized with hydrogen peroxide in the presence of ferrous sulfate and colorimetric determinations made (Cook and Ficklen, 1935) (*4*).

Concentrations of Benzene Determined Under Different Conditions.

Data regarding the determination of benzene in air are not very numerous but the report of Elkins (1939) (*6*) indicates that such determinations deserve more attention, inasmuch as he found that of approximately 200 determinations made in various Massachusetts industries 68 percent showed concentrations above 75 parts of benzene per million parts of air by volume. Occasionally much higher concentrations may be encountered, as illustrated by the report of Bowditch and Elkins (1939) (7) who found in the compounding room of one artificial leather plant concentrations of 160 and 190 parts per

million, respectively, and in another plant an average of 200 parts per million. Winslow (1927) (*11*) even found concentrations from 700 to 1,800 parts per million in certain operations.

Absorption and Excretion of Benzene.

Benzene is mainly absorbed by the lungs, but it is only partly excreted in this way and another part of the absorbed material is oxidized in the organism with the formation of phenol and diphenols which in turn are conjugated with sulfuric acid and excreted in the urine, thus reducing the amount of inorganic sulfates.

Determination of Benzene in Blood and Other Tests Indicating Exposure.

The same principles as used in the determination of benzene in air may also be applied to its determination in the blood. In these determinations benzene is removed from the blood by slow aeration, nitrated to dinitrobenzene and determined colorimetrically, as by the method of Schrenk, Pearce, and Yant (1935) (*3*).

Exposure to benzene may be detected by determining the inorganic and the total sulfates in the urine according to Yant, Schrenk, Sayers, Horvath, and Reinhart (1936) (*8*). A reduction of the ratio of inorganic over total sulfate indicates the existence of exposure to benzene. As shown by Yant et al. in animal experiments and as found in humans by Bowditch and Elkins (1939) (*7*), this method is only a true indicator of the intensity of the exposure if performed during or shortly after discontinuation of the exposure.

Relation Between Concentrations of Benzene in Air and Toxic Symptoms.

In regard to the toxic concentrations of benzene for man, many studies (*9, 10*) refer mainly to acute experiments, as illustrated in table 1.

TABLE 1.—*Acute toxicity of benzene for man*

[Flury, 1928 (*10*)]

Concentration, parts per million of air	
3,000	Tolerated for ½ to 1 hour.
7,500	Dangerous after ½ to 1 hour.
20,000	Fatal after 5 to 10 minutes.

Studies on concentrations, dangerous with continued exposure, show that concentrations of 100 parts of benzene per million parts of air are generally safe but that they may occasionally cause toxic symptoms with sufficient length of exposure in susceptible individuals (*11, 12*). Higher concentrations become rapidly dangerous, and fatal accidents have been reported from concentrations of 1,000 parts per million and less.

As with other forms of poisoning, there appears to be considerable variation regarding the susceptibility to exposure to benzene, as illus-

trated by the fact that in several instances only one or a few persons of a large group with evidently the same exposure developed the characteristic signs and symptoms of benzene poisoning.

Symptoms of Acute Benzene Poisoning.

In man, inhalation of large quantities of benzene rapidly causes inebriation. This is soon followed by fatigue, sleepiness, ringing in the ears, vertigo, nausea, vomiting, headache, and staggering gait. With prolonged inhalation of large quantities, twitching, tonic and clonic convulsions, paralysis, and loss of consciousness may result. The respiration is first increased but later slowed and circulatory collapse may result. With very large doses, unconsciousness, convulsions, and death due to respiratory paralysis may occur very rapidly. Depending upon the duration of the unconsciousness and the severity of the circulatory failure, nervous disturbances of different nature may be observed as aftereffects of such poisoning.

Symptoms of Chronic Benzene Poisoning.

The continued exposure to small quantities of benzene may cause such subjective symptoms as fatigue, somnolence, headache, vertigo, general debility, pupillary abnormalities, and gastro-intestinal disturbances. The most conspicuous effect is, however, the effect on the blood and the blood-forming organs, especially the bone marrow and the blood vessels. As a rule the white blood cells, especially the polynuclears, are the first to suffer, and a white cell count of 5,000 to 5,500 and below is usually considered as a sign of incipient benzene poisoning. It has been shown repeatedly, as pointed out by Hunter (1939) (*12*) and von Oettingen (1940) (*13*), that the ratio of polynuclears to mononuclears is a better index of incipient poisoning than a moderate leucopenia without differentiation of the different cell types. Several authors have also pointed to eosinophilia as an early alarm signal. On the other hand, it should also be mentioned that earlier investigators (*13*) and recently Hunter (*12*) observed not a reduction but an increase in the number of white blood cells. It appears that the blood picture may show considerable variation, depending upon the intensity and the duration of the exposure, the individual susceptibility, and the influence of other factors. Similarly the response of the red blood cells may show a tendency towards polycytemia or, more commonly, towards anemia. This usually occurs, however, after toxic effects on the white blood cells have become manifest and it is associated with corresponding changes of the hemoglobin content.

In the early stages of chronic benzene poisoning, hemorrhages under the skin and the mucous membranes may occur. Bleeding from the gastro-intestinal tract and from the uterus may be observed, and these may be contributing factors to the anemic condition. The

urine may contain albumin, casts, and bile pigments, indicating injury of kidneys and liver.

The *contact of benzene with the skin* may cause erythema, dry scaling, and, occasionally, vesicular papules. Benzene is a fat solvent. It removes the protective fat of the skin and predisposes to secondary infections. More prolonged exposure may result in injury resembling first- and second-degree burns.

Pathological Changes in Benzene Poisoning.

The most characteristic pathological changes are seen in the bone marrow which shows a variety of pictures varying from hyperplasia to hypoplasia and, occasionally, may result in complete aplasia of the myeloic cells (Mallory, Gall and Brickley, 1939) (*14*). This effect may not be solely restricted to the bone marrow but may extend also to the germinating structures of the lymphatic glands, the pulp of the spleen, the Peyer's plaques, and the cortex of the thymus. Benzene may cause degenerative changes in the liver, kidneys, and heart, varying in intensity with the concentration and the duration of the exposure. The mucous membranes of the gastro-intestinal tract are markedly congested and hemorrhages are not uncommon, and the same holds true for the pleura and the skin. Pathological changes of the blood picture are mainly characterized by leucopenia, but in mild and extreme cases leucocytosis may be observed. In the leucopenic stage there is a relative lymphocytosis. The severity of the poisoning is usually reflected in the reduction of leucocytes and the prognosis becomes bad as their number drops to or below 1,000. The changes of the red blood cells are much less severe and less characteristic. There may be a moderate anisocytosis without poikilocytosis and regenerative forms; in other instances the latter may be present, which may be interpreted as beginning injury of the bone marrow or as a sign of stimulation, as indicated by hyperplasia of the bone marrow. The formation of hemorrhages may be partly explained by an increase of the clotting time, perhaps on account of a reduction of the thrombocytes. It is partly due to vascular damage; the walls of the blood vessels may show degenerative changes of variable intensity, from turbid swelling to fatty degeneration, as may be seen in other organs.

Mechanism of Benzene Poisoning.

The depressant effect of benzene on the central nervous system is probably due to the same mechanism as with the anesthetics of the chlorinated hydrocarbon series and it is presumably closely affiliated with its lipoid solubility and partition coefficient in oil over water. The convulsant action is not yet completely understood but it is not due to the formation of phenols, as has been claimed, because the convulsions produced by the latter are of a different type. At present it

appears most likely that they are due to the anoxemia of the central nervous system caused by circulatory disturbances or by depression of the respiratory center. The anemiagenic effect is the most serious consequence of continued exposure and even comparatively low concentrations may cause such effects. It has been pointed out that hemorrhages may be a contributing factor but the principal cause is the effect on the bone marrow.

Habituation to Benzene.

Unlike other poisons, continued exposure to benzene does not increase the resistance of the organism towards its toxic effects. On the contrary, repeated subtoxic exposure may finally result in sudden and severe injury, as has been observed repeatedly.

Prophylactic Measures.

In order to prevent benzene poisoning, cleanliness of the operation, especially regarding spilling of benzene or benzene-containing materials, is of great importance. The pollution of the air should be prevented by using closed operations whenever possible and such operations should be inspected regularly to insure against leakage and breaks. Whenever such enclosures have to be entered, it should be made certain that they are free from benzene. In case of doubt they should not be entered without proper safety appliances such as air-supplied masks and safety belts. Such work should be performed in the presence of supervisors who are familiar with the potential dangers and the first-aid measures.

In those operations where benzene is used as a solvent and where the pollution of the air by evaporation can hardly be avoided, proper local exhaust ventilation should be provided. Where benzene is evaporated at room temperature, air removal with down draft has been recommended (*11*). Where localized heat is applied, hoods or enclosures should be provided with up-draft local exhaust ventilation of sufficient intensity and sufficiently close to the source of contamination to insure complete removal of the benzene vapors.

In addition, the proper placement of the personnel is of paramount importance. Juvenile workers appear to be more susceptible than adult males. Chlorosis, tuberculosis, and pregnancy are considered as aggravating factors, and persons suffering from organic heart disease, tendency to hemorrhages, and anemia offer especial risks.

Every person with exposure to benzene should undergo periodical examinations, and special emphasis should be placed on the blood picture; this should not be restricted to the leucocyte count alone but a complete differential count should be made. Decrease of the leucocyte count to less than 5,000, relative lymphocytosis, or eosinophilia should be considered as contraindication for further exposure. But any abnormality such as leucocytosis should also be considered as

a warning signal. Moderate reduction of the red blood cell count of the hemoglobin should also be taken as indication of the beginning of an injurious effect, and the same holds true for any signs of bleeding and hemorrhages. In addition, the ratio of inorganic to total sulfates should be determined, a reduction of which will indicate the existence of exposure to benzene (*8*). In case, upon repeated examination, the percentage of organic sulfates is 30 percent or more, the concentration of benzene in the air of such operations should be determined and reduced by proper engineering methods.

The Treatment of Benzene Poisoning.

Acute benzene poisoning of moderate degree regresses, usually, promptly after transfer of the patient to fresh air. In more severe cases, especially if the patient is unconscious, he should be transferred to fresh air but any chilling should be avoided and he should be treated symptomatically by a qualified physician. Cases of chronic benzene poisoning require very careful supervision. Especially if the condition is associated with leucopenia, the danger of a secondary infection should be reduced to a minimum because experience has shown that even in the absence of distinct signs of injury to the blood-forming organs, infections may precipitate catastrophic complications. Usually benzene anemia does not very readily respond to blood transfusions nor to liver therapy, but from combination of the latter with iron and the administration of vitamin C better results have been reported (*cf.* von Oettingen, 1940) (*13*).

REFERENCES

(Those publications preceded by an asterisk (*) are out of print, and those preceded by two asterisks (**) may be obtained from the U. S. Public Health Service, Washington, D. C. It is believed that most of the other publications may be consulted at local medical or technical libraries, or access to them may be secured through State health departments.)

(*1*) Ellis, C., and Meigs, J. V.: Gasoline and Other Motor Fuels. Constable and Company, 1921.

(*2*) Smyth, H. F., Jr.: Determination of small amounts of benzene vapors in air. J. Ind. Hyg., **11:** 338 (1929); **13:** 227 (1931).

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(*6*) Elkins, H. B.: Toxic fumes in Massachusetts industries. Indust. Med., **8:** 426 (1939).

(*7*) Bowditch, M., and Elkins, H. B.: Chronic exposure to benzene (benzol). I. The industrial aspects. J. Ind. Hyg. and Toxicol., **21:** 321 (1939).

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(10) Flury, F.: Modern industrial poisonings in pharmacological and toxicological respect. Arch. exp. Path. Pharmakol., 138: 65 (1928).
(11) Winslow, C.-E. A.: Summary of the National Safety Council Study of benzene poisoning. J. Ind. Hyg., 9: 61 (1927).
(12) Hunter, F. T.: Chronic exposure to benzene (benzol). II. The clinical effects. J. Ind. Hyg. and Toxicol., 21: 331 (1939).
*(13) von Oettingen, W. F.: Toxicity and potential dangers of aliphatic and aromatic hydrocarbons. Pub. Health Bull. No. 255, U. S. Government Printing Office, 1940.
(14) Mallory, T. B., Gall, E. A , and Brickley, W. J.: Chronic exposure to benzene (benzol). III. The pathologic results. J. Ind. Hyg. and Toxicol., 21: 355 (1939).
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REPORTED PREVALENCE OF THE COMMON COMMUNICABLE DISEASES DURING 1940

Of the nine common communicable diseases (diphtheria, influenza, measles, meningococcus meningitis, poliomyelitis, scarlet fever, smallpox, typhoid fever, and whooping cough) reported regularly to the Public Health Service each week by the State health officers, the incidence of only two—influenza and poliomyelitis—was above the 5-year (1935 39) median during 1940. The incidence of the other seven of these diseases was not only below the 5-year median but was lower than that for any of the preceding 5 years (1935–39).[1]

The accompanying tables show the totals of the numbers of cases reported weekly by telegraph during 1940 (for 52 weeks ended December 28) and the case rates per 100,000 population for the country as a whole and by geographic areas.

It should be borne in mind that these figures are preliminary and will not agree, in most instances, with the final figures furnished by the States after the end of the calendar year and published annually by the Public Health Service as a supplement to the Public Health Reports under the title "The Notifiable Diseases; Prevalence in States." In recent years, however, there has been fairly close agreement with the final figures with respect to each of these diseases except influenza.

The 5-year (1935-39) median and other figures used for comparison are taken from similar preliminary reports.

As these are reported cases, it is recognized that, for various reasons, the figures are incomplete. Also, since the degree of completeness may vary in the different geographic areas, some of the differences shown must be attributed in part to reporting rather than to actual differences in the true prevalence of the disease.

[1] The incidence of whooping cough was the lowest since 1936.

TABLE 1.—*Number of cases reported in 1940 and comparison with 5-year median (weekly telegraphic reports)*

	Diphtheria	Influenza	Measles	Meningococcus meningitis	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever	Whooping cough
1940	15,715	309,669	276,032	1,609	9,769	155,064	2,462	9,585	170,911
5-year median (1935–1939)	28,779	157,823	374,854	5,390	7,288	223,425	9,574	14,609	[1] 191,391

[1] 3-year (1938–40) average.

TABLE 2.—*Case rates per 100,000 population, 1940, by geographic areas (weekly telegraphic reports)*

Division	Diphtheria	Influenza	Measles	Meningococcus meningitis	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever	Whooping cough
United States	12.0	257.0	211.5	1.2	7.4	118.0	1.9	7.3	130.4
New England	3.4	5.2	467.3	1.1	1.1	107.0	0	3.5	169.8
Middle Atlantic	7.2	4.4	220.1	1.3	1.7	169.2	0	4.1	159.2
East North Central	9.1	37.3	187.5	.8	13.8	199.1	2.1	3.9	138.9
West North Central	8.8	47.0	183.3	1.0	17.2	97.1	7.0	4.9	68.5
South Atlantic	20.5	431.4	85.0	1.5	6.1	59.9	.3	10.4	114.7
East South Central	15.1	219.8	90.8	2.2	3.5	66.4	1.1	11.5	63.5
West South Central	20.4	857.6	166.1	1.1	3.4	27.5	2.7	18.4	96.0
Mountain	18.8	1,000.2	455.7	1.3	8.3	107.3	7.5	11.3	225.5
Pacific	11.6	678.7	392.2	.9	9.8	80.2	1.5	5.0	188.8

Diphtheria.—The number of diphtheria cases reported in 1940 was only about 55 percent of the 5-year (1935–39) median. The highest reported incidence was in the Southern and Mountain States and the lowest in the New England States, with the Middle Atlantic and North Central areas taking an intermediate position. Both the South Atlantic and West South Central States showed case rates of more than 20 per 100,000 population, or six times as high as the rate for the New England group (3.4).

Influenza.—The incidence of influenza during the calendar year 1940 was the highest since 1932, and was 96 percent above the 5-year median. The highest incidence was recorded in the Mountain, West South Central, and Pacific States, where Utah, Texas, and California reported the largest numbers of cases. Up to the end of the year, the New England, Middle Atlantic, and North Central areas had been comparatively free from the disease.

As the peak of influenza for the country as a whole usually comes in the late winter or early spring, and as the mild epidemic of the current season began on the West Coast late in November and apparently spread eastward through the Southern States, the figures for the calendar year may not present an accurate comparative picture for the epidemic period.

Measles.—The number of cases of measles reported during 1940 was below that for any of the preceding 5 years. The highest incidence

was recorded in the New England and Mountain States, where the case rates were more than twice the rate for the country as a whole, with the Pacific States next. In only one other area, the Middle Atlantic group, was the rate above that for the country as a whole. The lowest incidence was reported for the South Atlantic and East South Central States, where the rates were less than one-fifth the rate for the New England and Mountain areas.

Meningococcus meningitis.[2]—With only 1,609 cases reported, the incidence of meningococcus meningitis was also lower in 1940 than in any of the preceding 5 years, and was only about 30 percent of the 5-year (1935–39) median. This disease has registered a decline each year since 1936, when 7,392 cases were reported. The highest case rates are shown for the East South Central area, and the lowest for the East North Central and Pacific States.

Poliomyelitis.—A larger number of cases of poliomyelitis was reported in 1940 than in any year since 1935, when 10,732 cases were recorded. The lowest incidence in the preceding 5-year period occurred in 1938, when only 1,710 cases were reported. Preponderantly higher case rates in 1940 are shown for the two North Central groups of States, with the Pacific States next, where California contributed the largest number of cases. The lowest incidence was recorded for the New England and Middle Atlantic areas.

Scarlet fever.—The number of cases of scarlet fever reported in 1940 was about 69 percent of the 5-year median. The pattern of comparative geographic distribution is somewhat similar to that for measles and whooping cough, with the highest incidence rates being recorded for the New England, Middle Atlantic, East North Central, and Mountain States, the only areas with rates higher than 100 per 100,000 population.

Smallpox.—A record low was established in 1940 for smallpox, with only 2,462 cases reported, or about 26 percent of the 5-year median. This may be compared with 48,907 cases reported in 1930, and with 5,371 in 1934, the previous minimum. No cases were reported during the year in the nine New England and Middle Atlantic States, while the highest incidence was recorded for the West North Central and Mountain States.

Typhoid fever.—A new low was also established in 1940 for typhoid fever (including paratyphoid) with a total of 9,585 cases reported, or about 66 percent of the 5-year median. The previous minimum of 12,736 cases was reported in 1939. The case rates show the highest

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[2] During 1940, a total of 12,821 cases of meningococcus meningitis was reported in England and Wales (30.8 per 100,000 population) as compared with 1,516 cases in 1939 and 1,288 in 1938. The rise began in December 1939 and continued through the week of March 2, 1940, when 623 cases were reported, thereafter declining throughout the remainder of the year. The period of highest incidence was between February 4 and March 30, when 4,316 cases were reported.

incidence in the Southern and Mountain States, the West South Central group leading with a rate 50 percent higher than the next highest rates and two and one-half times the rate for the country as a whole.

Whooping cough.—This disease was included in the list of diseases reported weekly by telegraph in 1938. The number of cases reported in 1940 was the lowest for the 3-year period, and approximately 89 percent of the average for the 3 years. The highest incidence rates are those for the Northeastern and Mountain and Pacific States.

PUBLIC HEALTH SERVICE PUBLICATIONS

A List of Publications Issued During the Period July–December 1940

There is printed herewith a list of publications of the United States Public Health Service issued during the period July–December 1940.

The purpose of the publication of this list is to provide a complete and continuing record of Public Health Service publications, for reference use by librarians, scientific workers, and others interested in particular fields of public health work, and not to offer the publications for indiscriminate free public distribution.

Those publications marked with an asterisk (*) can be obtained only by purchase from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the prices noted.

Periodicals

*Public Health Reports (weekly), July–December, vol. 55, nos. 28 to 52, pages 1193 to 2412. 5 cents a number.

*Venereal Disease Information (monthly), July–December, vol. 21, nos. 7 to 12, pages 205 to 412. 5 cents a number.

Reprints From the Public Health Reports

2175. Studies in childbirth mortality. II. Age and parity as factors in puerperal fatality. By Jacob Yerushalmy, Carroll E. Palmer, and Morton Kramer. July 5, 1940. 26 pages.

2176. A rapid thick film blood stain. By Louis Michelson and Aimee Wilcox. July 5, 1940. 2 pages.

2177. Development of the national maritime quarantine system of the United States. By Brock C. Hampton. July 12, 1940. 17 pages; 6 plates.

2178. Studies on dental caries. IX. The prevalence and incidence of dental caries experience, dental care, and carious defects requiring treatment in high school children. By Henry Klein and Carroll E. Palmer. July 12, 1940. 11 pages.

2179. A study of the role of ventilating systems in the transmission of bacteria. By J. M. DallaValle and Alexander Hollaender. July 12, 1940. 5 pages; 1 plate.

2180. American azures in the preparation of satisfactory Giemsa stains for malaria parasites. By M. A. Roe, R. D. Lillie, and A. Wilcox. July 12, 1940. 6 pages.

2181. Natural infection of *Triatoma heidemanni* with *Trypanosoma cruzi* in Texas. By Ardzroony Packchanian. July 19, 1940. 6 pages; 2 plates.

2182. The isolation and pathogenicity of *Pityrosporum ovale.* By C. W. Emmons. July 19, 1940. 8 pages.

2183. Protective ointment for the prevention of poison ivy dermatitis. By Louis Schwartz, Leon H. Warren, and Frederick H. Goldman. July 26, 1940. 8 pages; 4 plates.

2184. Effect of synthetic pantothenic acid on adrenal hemorrhage, atrophy, and necrosis in rats. By Floyd S. Daft, W. H. Sebrell, S. H. Babcock, Jr., and T. H Jukes. July 26, 1940. 5 pages.

2185. Disease outbreaks resulting from faulty environmental sanitation. By Leslie C. Frank. August 2, 1940. 11 pages.

2186. Report on market-milk supplies of certain urban communities, July 1, 1938-June 30, 1940. August 2, 1940. 8 pages.

2187. Susceptibility and resistance of certain species of American deer mice, genus *Peromyscus*, and other rodents to *Leptospira icterohaemorrhagiae.* By Ardzroony Packchanian. August 2, 1940. 14 pages; 2 plates.

2188. Disabling morbidity among male and female industrial workers during 1938 and 1939, and among males during the first quarter of 1940, with an inquiry into the occurrence of multiple attacks of disabling sickness and injuries, 1939. By William M. Gafafer. August 2, 1940. 5 pages.

2189. The incidence of cancer in Pittsburgh and Allegheny county, Pennsylvania, 1937. By Arthur J. McDowell. August 9, 1940. 33 pages.

2190. Evaluation of a mouse test for the standardization of the immunizing power of anti-rabies vaccines. By Karl Habel. August 16, 1940. 16 pages.

2191. Helium-oxygen mixtures for alleviation of tubal and sinus block in compressed air workers. By J. W. Crosson, Roy R. Jones, and R. R. Sayers. August 16, 1940. 9 pages.

2192. Disabling morbidity, and mortality from cancer among the male employees of an oil refining company with reference to age, site, and duration, 1933-38, inclusive. By William M. Gafafer and Rosedith Sitgreaves. August 23, 1940. 10 pages.

2193. Experimental transmission of *Trypanosoma cruzi* infection in animals by *Triatoma sanguisuga ambigua* By Ardzroony Packchanian. August 23, 1940. 8 pages; 2 plates.

2194. A diagnosis code for use in tabulating morbidity statistics. By Thomas Parran and William L. Austin. August 30, 1940. 18 pages.

2195. Rheumatic heart disease in Philadelphia hospitals. A study of 4,653 cases of rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis involving 5,921 admissions to Philadelphia hospitals, from January 1, 1930, to December 31, 1934. I. Rheumatic heart disease, rheumatic fever, Sydenham's chorea, and subacute bacterial endocarditis as a hospital problem. II. Age, race, and sex distribution and interrelation of rheumatic fever, Sydenham's chorea, rheumatic heart disease, and subacute bacterial endocarditis. III. Fatal rheumatic heart disease and subacute bacterial endocarditis. IV. Influence of season and certain meteorological conditions. V. Distribution by locality of rheumatic conditions in Philadelphia. By O. F. Hedley. September 6, 13, 20, October 4, 11, 1940. 139 pages; 4 halftones.

2196. Factors influencing the efficacy of phenolized rabies vaccines. I. Strains of fixed virus. By Karl Habel. September 6, 1940. 13 pages.

2197. A new apparatus for the administration of helium-oxygen mixtures. By Howard F. Brubach, Laurence R. Crisp, and Paul A. Neal. September 27, 1940. 6 pages; 2 plates.

2198. A brief review of needed research in malaria. October 4, 1940. 9 pages.

2199. *Rickettsia diaporica:* Its persistence in the tissues of *Ornithodoros turicata.* By Gordon E. Davis. October 11, 1940. 3 pages.

2200. Sanitary and physiological aspects of flooring materials. By Joseph M. DallaValle. October 18, 1940. 8 pages.

2201. Studies on the duration of disabling sickness. I. Duration of disability from sickness and nonindustrial injuries among the male and female memberships of 25 industrial sick benefit organizations, 1935–37, inclusive. By William M. Gafafer and Elizabeth S. Frasier. October 18, 1940. 12 pages.

2202. The housing problem as it affects public health nursing activities. By Mary J. Dunn. October 18, 1940. 6 pages.

2203. An institutional outbreak of pneumonitis. I. Epidemiological and clinical studies. By J. W. Hornibrook and K. R. Nelson. II. Isolation and identification of causative agent. By R. E. Dyer, N. H. Topping, and I. A. Bengtson. October 25, 1940. 19 pages; 6 plates.

2204. The relation of body build to drug addiction. By Ralph R. Brown. October 25, 1940. 10 pages.

2205. Frequency and volume of doctors' calls among males and females in 9,000 families, based on Nation-wide periodic canvasses, 1928–31. By Selwyn D. Collins. November 1, 1940. 44 pages.

2206. Teaching of social medicine in liberal arts colleges and universities. By Joseph Hirsh and Elizabeth G. Pritchard. November 8, 1940. 20 pages.

2207. Accidents in the urban home as recorded in the National Health Survey. By Rollo H. Britten, Joan Klebba, and David E. Hailman. November 8, 1940. 26 pages.

2208. Studies of the acute diarrheal diseases. IV. An outbreak of bacillary dysentery due to the "Newcastle dysentery bacillus." By A. V. Hardy, S. Frant, S. W. Jarcho, and E. G. Schlosser. November 15, 1940. 16 pages.

2209. Experimental production of agglutinins for *Trypanosoma cruzi.* By Ardzroony Packchanian. November 15, 1940. 8 pages.

2210. A comprehensive study of influenza in a rural community. By E. R. Rickard, Edwin H. Lennette, and Frank L. Horsfall, Jr. November 22, 1940. 22 pages.

2211. A sanitary log for American ships. Description and plan of operation. By G. C. Sherrard. November 22, 1940. 5 pages.

2212. The tumor clinic of the Baltimore Marine Hospital. By Ernest R. Bryan. November 29, 1940. 5 pages; 3 plates.

2213. The National Health Survey. Receipt of medical services in different urban population groups. By Rollo H. Britten. November 29, 1940. 26 pages.

2214. Colorado tick fever. By Norman H. Topping, James S. Cullyford, and Gordon E. Davis. November 29, 1940. 14 pages.

2215. Studies on foodstuffs fumigated with methyl bromide. By H. C. Dudley, J. W. Miller, P. A. Neal, and R. R. Sayers. December 6, 1940. 32 pages.

2216. Smallpox in the United States: Its decline and geographic distribution. By C. C. Dauer. December 13, 1940. 10 pages.

2217. Qualifications of professional public health personnel. I. Plan and scope of the survey. By Mayhew Derryberry and George Caswell. December 13, 1940. 8 pages.

2218. A recommended procedure for the mouse protection test in evaluation of antimeningococcus serum. By Sara E. Branham and Margaret Pittman. December 20, 1940. 7 pages.

2219. Ticks and relapsing fever in the United States. By Gordon E. Davis. December 20, 1940. 5 pages.

2220. Qualifications of professional public health personnel. II. Health officers and other medical personnel. By Mayhew Derryberry and George Caswell. December 27, 1940. 20 pages.

2233. Chest fluorography with portable X-ray equipment on 35 mm. film. By W. Palmer Dearing and Alexander E. Turner. December 27, 1940. 9 pages; 4 plates.

Supplement to the Public Health Reports

162. Eugenic sterilization in the United States. A comparative summary of statutes and review of court decisions. By James E. Hughes. 1940. 45 pages.

Public Health Bulletins

254. Plague in the western part of the United States. By C. R. Eskey and V. H. Haas. 1940. 83 pages; 57 halftones.

255. Toxicity and potential dangers of aliphatic and aromatic hydrocarbons. A critical review of the literature. By W. F. von Oettingen. 1940. 135 pages.

256. Plumbing and public health. By Arthur B. Cronkright and Arthur P. Miller. 1940. 118 pages; 9 halftones.

257. Cancer mortality in the United States. III. Geographic variation in recorded cancer mortality for detailed sites, for an average of the years 1930-32. By Mary Gover. 1940. 81 pages.

258. A study of medical problems associated with transients. By Charles F. Blankenship and Fred Safier. 1940. 132 pages; 11 halftones.

259. A preliminary survey of the industrial hygiene problem in the United States. By J. J. Bloomfield, V. M. Trasko, R. R. Sayers, R. T. Page, and M. F. Peyton. 1940. 132 pages.

National Institute of Health Bulletins

174. Studies in chronic selenosis. Part I. The chronic toxicity of naturally occurring food selenium. By M. I. Smith and R. D. Lillie. Part II. Gastric acidity in chronic selenium poisoning. By M. I. Smith and E. F. Stohlman. Part III. Liver function and bile pigments in experimental chronic selenium poisoning. By M. I. Smith, B. B. Westfall, and E. F. Stohlman. Part IV. Selenium in the hair as an index of the extent of its deposition in the tissues in chronic poisoning. By B. B. Westfall and M. I. Smith. 1940. 49 pages; 4 halftones.

176. Acute response of guinea pigs to the inhalation of ketone vapors. By H. Specht, J. W. Miller, P. J. Valaer, and R. R. Sayers. 66 pages.

Unnumbered publication

Index to Public Health Reports, volume 55, part 1, January–June 1940. 19 pages.

Reprints from Venereal Disease Information

129. A study of consultation by correspondence in syphilis. 2,000 questions the doctor asks about syphilis. By John H. Stokes, Norman R. Ingraham, Jr., and Emily Stannard. Vol. 21, May 1940. 28 pages.
130. Serodiagnostic tests as performed in State laboratories, 1938–39. Report of committee on evaluation of serodiagnostic tests for syphilis. Vol. 21, June 1940. 13 pages.
131. Development of sulfapyridine-fast strains of the gonococcus. By Louise Westphal, Ruth L. Charles, and C. M. Carpenter. Vol. 21, June 1940. 4 pages.
132. Venereal disease control program in Georgia. By L. E. Burney. Vol. 21, June 1940. 3 pages.
133. Gonococcal vaginitis. By Alfred Cohn, Arthur Steer, and Eleanor L. Adler. Vol. 21, July 1940. 13 pages.
137. A common error in obtaining specimens for the cultural diagnosis of gonococcal infections in women. By Frederick G. Gillick, S. Edward Sulkin, and Leroy J. Stephens. Vol. 21, September 1940. 3 pages.

Supplements to Venereal Disease Information

11. Technics of serodiagnostic tests for syphilis. 72 pages.
12. Conference on Venereal Disease Control. 37 pages.

Venereal Disease Bulletin

94. It can happen to you. 13 pages.

Venereal Disease Posters

10. Syphilis strikes 1 in 10 before 50.
11. A blood test for every one—the only sure check.

COURT DECISION ON PUBLIC HEALTH

Licensing of business of rendering.—(Wisconsin Supreme Court; *LaForge et al.* v. *State Board of Health et al.*, 296 N.W. 93; decided February 4, 1941.) Certain persons who were residents of, and engaged in the business of rendering in, Illinois desired to collect dead animal matter in Wisconsin and transport it to their plant in Illinois. Under a Wisconsin statute the transportation of such matter on the public highways of the State was unlawful except by a renderer licensed under the statute, and the said persons sought by mandamus to compel the Wisconsin State Board of Health to issue a renderer's license to them. The statute further provided that the transportation of dead animal matter into other States should not be allowed "except by reciprocal agreement with adjoining States or under rules" of the State board of health. The order of the trial court was adverse to the petitioners and this order was affirmed by the supreme court.

The business of rendering, according to the appellate court, included the collection of dead animal matter and its transportation to and disposal at a rendering plant. The plants in which rendering took place were to be constructed and operated according to the terms

of the statute, which terms associated process and place. "In the granting of the licenses it is required that both be subject to inspection and regulation. Necessarily these elements are bound together and constitute a single licensed operation." It appearing that there was no reciprocal agreement between Wisconsin and any adjoining State, the court then considered whether the statutory wording "or under rules of the board" would aid the petitioners. The court said that, in considering such language, it must be evident that no rule of the board of health could bring to that board the right to inspect and regulate a rendering plant in a neighboring State. Although an operator of a plant might be willing to do everything he could to satisfy the board's requirements, a license was not to issue except where the board had a right to inspect and where the plant had been constructed to comply with the statutory specifications. The view of the court was that the words under consideration related to things other than the issuing of a license and that the true meaning of the enactment was expressed when the phrase was read "except by reciprocal agreement and under rules of the board." "There must be a reciprocal agreement before there would in such case be occasion for a rule."

DEATHS DURING WEEK ENDED MARCH 1, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 1, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,286	9,333
Average for 3 prior years	9,382	
Total deaths, first 9 weeks of year	87,648	86,683
Deaths under 1 year of age	585	508
Average for 3 prior years	534	
Deaths under 1 year of age, first 9 weeks of year	4,938	4,846
Data from industrial insurance companies:		
Policies in force	64,657,311	66,104,679
Number of death claims	14,562	15,157
Death claims per 1,000 policies in force, annual rate	11.7	12.0
Death claims per 1,000 policies, first 9 weeks of year, annual rate	10.9	10.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 8, 1941

Summary

The incidence of measles again recorded an increase over the preceding week, with 34,420 cases reported currently as compared with 31,490 for the earlier week. The rate of increase, however, showed a decline. The Middle Atlantic, East North Central, and South Atlantic States continue to report the highest incidence. The number of cases reported currently is 3 times the 5-year (1936–40) median, while the total number reported to date this year (first 10 weeks) is a little more than 2½ times the 5-year cumulative median for the corresponding period. This 5-year period, however, includes only one "measles year"—1938.

For the first time since the decline in influenza began, during the week ended January 25, 1941, the reported weekly incidence (8,204 cases) dropped below the 5-year median (11,131). For the first 10 weeks of the current year, a total of 550,097 cases has been reported as compared with a 5-year cumulative median of 69,182.

Of 23 cases of endemic typhus fever, 10 cases occurred in Georgia and 7 in Texas; and of 44 cases of smallpox, 8 cases were reported in Washington State, 6 in Minnesota, and 5 in Iowa. One case of undulant fever was reported in North Carolina and 1 case of Rocky Mountain spotted fever in Montana.

The death rate for the current week for 92 major cities in the United States, as reported by the Bureau of the Census, was 12.7 per 1,000 population, as compared with 13.0 for the preceding week and with a 3-year (1938–40) average of 13.1 for 88 cities.

Telegraphic morbidity reports from State health officers for the week ended March 8, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40
	Mar. 8, 1941	Mar. 9, 1940		Mar. 8, 1941	Mar. 9, 1940		Mar. 8, 1941	Mar. 9, 1940		Mar. 8, 1941	Mar. 9, 1940	
NEW ENG.												
Maine	0	1	1	6	1	8	208	236	147	0	1	0
New Hampshire	0	0	0	8	------	------	81	140	26	0	0	0
Vermont	0	0	0	------	------	------	17	7	19	0	0	0
Massachusetts	2	2	2	------	------	------	594	266	810	1	2	2
Rhode Island	0	0	1	------	------	------	0	161	39	0	1	1
Connecticut	1	3	2	26	9	26	52	238	238	1	0	0
MID. ATL.												
New York	26	17	37	[1] 59	[1] 40	[1] 47	6,415	467	1,482	1	2	11
New Jersey	6	7	10	123	13	28	2,071	183	183	1	0	1
Pennsylvania	14	35	46	------	------	------	3,995	221	299	8	5	6
E. NO. CEN.												
Ohio	17	22	21	273	36	36	4,742	27	137	2	2	4
Indiana	12	9	16	52	86	86	450	12	12	1	1	1
Illinois	17	23	35	34	56	63	3,266	58	57	2	1	5
Michigan [2]	7	5	10	28	12	6	3,159	319	319	3	1	1
Wisconsin	0	4	3	175	420	91	873	377	377	0	1	1
W. NO. CEN.												
Minnesota	1	1	3	26	4	4	5	240	240	1	0	0
Iowa	3	4	4	247	28	17	183	328	163	0	0	1
Missouri	7	11	18	22	8	195	86	8	14	0	0	3
North Dakota	1	2	2	30	36	6	9	6	6	0	0	0
South Dakota	0	1	1	4	1	1	11	2	4	0	0	0
Nebraska	1	2	3	14	7	7	6	33	33	1	0	1
Kansas [3]	3	11	11	20	29	43	564	522	49	3	1	0
SO. ATL.												
Delaware	1	0	0	------	------	------	431	1	28	0	0	0
Maryland [2]	2	2	7	57	53	53	104	5	195	2	0	1
Dist. of Col	0	6	7	46	------	4	89	0	16	1	0	1
Virginia [3]	9	18	15	1,016	1,182	1,182	1,537	48	241	3	1	2
West Virginia [2]	4	11	8	113	893	135	306	10	10	0	4	5
North Carolina	20	14	14	135	116	278	649	170	170	1	0	1
South Carolina [3]	5	7	4	958	766	1,005	194	18	36	1	1	2
Georgia [3]	6	3	9	267	287	420	341	156	156	0	0	1
Florida [3]	2	5	7	154	26	20	438	137	46	2	1	1
E. SO. CEN.												
Kentucky	9	8	9	80	83	83	657	56	81	1	1	6
Tennessee	9	4	4	275	261	452	364	117	117	0	1	3
Alabama [3]	8	13	11	401	501	1,126	279	174	174	5	1	1
Mississippi [2]	1	6	5	------	------	------	------	------	------	3	2	1
W. SO. CEN.												
Arkansas	4	5	8	665	501	346	152	6	6	1	0	0
Louisiana	4	7	10	42	135	135	21	5	11	2	0	1
Oklahoma	5	4	7	253	355	337	5	7	25	3	0	1
Texas [3]	44	34	44	1,658	2,854	1,279	620	745	420	2	2	5
MOUNTAIN												
Montana [4]	0	9	2	19	8	23	1	28	46	0	0	0
Idaho	0	1	1	------	2	5	3	58	29	0	2	0
Wyoming	0	0	0	5	10	------	48	39	12	0	1	0
Colorado	15	4	8	61	30	------	213	25	25	0	1	0
New Mexico	0	0	2	51	3	9	220	9	44	0	0	0
Arizona	2	4	4	157	273	191	203	42	42	0	0	0
Utah [2]	1	1	0	8	9	------	35	264	145	0	0	0
Nevada	1	------	------	172	------	------	0	------	------	0	------	------
PACIFIC												
Washington	4	0	1	18	3	3	96	930	329	0	0	1
Oregon	1	2	1	40	42	57	418	471	41	0	0	0
California	9	20	28	[3] 406	411	411	209	417	417	3	2	4
Total	284	348	450	8,204	9,590	11,131	34,420	7,789	11,276	55	38	85
10 weeks	2,942	4,064	5,506	550,097	133,764	69,182	179,301	52,598	69,341	453	389	943

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 8, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Mar. 8, 1941	Mar. 9, 1940		Mar. 8, 1941	Mar. 9, 1940		Mar. 8, 1941	Mar. 9, 1940		Mar. 8, 1941	Mar. 9, 1940	
NEW. ENG.												
Maine	0	0	0	12	13	17	0	0	0	0	0	0
New Hampshire	0	0	0	7	2	13	0	0	0	0	0	0
Vermont	0	0	0	4	23	19	0	0	0	0	0	0
Massachusetts	0	0	0	124	140	256	0	0	0	2	1	1
Rhode Island	0	0	0	5	16	16	0	0	0	0	0	0
Connecticut	0	0	0	55	69	111	0	0	0	1	2	1
MID. ATL.												
New York	0	1	1	467	933	937	0	0	0	4	2	6
New Jersey	0	0	0	309	380	232	0	0	0	3	1	2
Pennsylvania	0	1	1	290	430	649	0	0	0	5	7	7
E. NO. CEN.												
Ohio	0	0	0	397	307	454	0	0	2	4	3	3
Indiana	0	0	0	161	288	238	2	2	3	2	1	1
Illinois	1	0	1	448	655	714	0	3	22	2	3	5
Michigan [2]	0	0	0	211	299	609	0	0	1	8	5	3
Wisconsin	0	4	1	137	149	238	2	6	9	2	3	2
W. NO. CEN.												
Minnesota	0	0	0	66	98	153	6	12	9	0	0	0
Iowa	1	0	0	65	65	198	5	4	31	1	1	1
Missouri	0	0	0	126	70	195	2	8	11	2	2	3
North Dakota	0	0	0	12	25	25	0	1	1	0	0	0
South Dakota	1	0	0	16	13	40	0	0	8	0	0	0
Nebraska	0	0	0	30	26	57	0	1	10	0	0	0
Kansas [3]	1	0	0	53	82	207	6	1	20	1	0	1
SO. ATL.												
Delaware	0	0	0	10	14	10	0	0	0	0	1	0
Maryland [3]	0	0	0	51	57	57	0	0	0	1	3	2
Dist. of Col.	0	0	0	20	35	24	0	0	0	1	0	0
Virginia [3]	1	0	0	31	61	36	0	0	0	3	3	3
West Virginia [3]	0	1	0	57	56	40	0	0	0	1	3	3
North Carolina	0	0	0	62	61	43	0	0	0	0	1	3
South Carolina [3]	0	0	0	13	5	5	0	0	0	9	0	0
Georgia [3]	0	1	0	23	22	17	0	1	1	3	2	2
Florida [3]	3	0	0	8	10	9	0	0	0	3	5	3
E. SO. CEN.												
Kentucky	1	0	1	185	69	72	0	0	1	12	4	3
Tennessee	0	0	0	155	76	34	0	0	2	8	0	1
Alabama [3]	1	2	1	19	13	17	0	0	0	0	1	2
Mississippi [3]	0	0	1	9	7	7	0	1	0	2	1	1
W. SO. CEN.												
Arkansas	1	0	0	13	7	12	2	5	5	1	1	2
Louisiana	0	0	0	4	26	17	0	0	1	3	2	13
Oklahoma	1	0	0	22	15	33	4	42	16	3	0	3
Texas [3]	1	0	1	62	52	87	2	0	9	4	3	8
MOUNTAIN												
Montana [4]	0	0	0	40	42	42	0	0	7	0	0	0
Idaho	0	0	0	8	15	19	0	1	4	0	0	0
Wyoming	0	0	0	9	9	14	0	0	0	0	1	0
Colorado	0	0	0	23	43	44	2	1	3	1	0	0
New Mexico	0	0	0	5	11	30	0	0	0	0	0	0
Arizona	0	0	0	4	4	9	0	0	0	2	1	0
Utah [2]	0	0	0	5	17	31	0	0	0	2	1	0
Nevada	0	-----	-----	8	-----	-----	1	-----	-----	2	-----	-----
PACIFIC												
Washington	1	0	0	20	35	55	8	0	6	1	0	1
Oregon	2	0	0	12	23	35	2	0	19	0	3	2
California	1	2	1	102	156	235	0	5	11	6	2	3
Total	17	12	16	3,981	5,024	6,900	44	94	285	105	69	106
10 weeks	306	287	211	34,351	45,937	61,200	457	734	2,942	736	739	1,101

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 8, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough, Week ended Mar. 8, 1941	Whooping cough, Week ended Mar. 9, 1940
NEW ENG.		
Maine	56	50
New Hampshire	3	10
Vermont	10	25
Massachusetts	269	178
Rhode Island	12	9
Connecticut	68	20
MID. ATL.		
New York	361	404
New Jersey	72	108
Pennsylvania	320	472
E. NO. CEN.		
Ohio	358	138
Indiana	9	40
Illinois	98	138
Michigan [2]	274	115
Wisconsin	145	113
W. NO. CEN.		
Minnesota	103	33
Iowa	61	23
Missouri	57	27
North Dakota	30	8
South Dakota	21	2
Nebraska	14	3
Kansas [3]	171	38
SO. ATL.		
Delaware	9	8
Maryland [2]	59	250
Dist. of Col.	6	24
Virginia [3]	143	36
West Virginia [2]	53	32
SO. ATL.—continued		
North Carolina	272	95
South Carolina [3]	124	15
Georgia [3]	17	38
Florida [3]	13	14
E. SO. CEN.		
Kentucky	42	72
Tennessee	89	36
Alabama [3]	10	23
Mississippi [2]	--------	--------
W. SO. CEN.		
Arkansas	16	7
Louisiana	3	1
Oklahoma	26	2
Texas [3]	342	195
MOUNTAIN		
Montana [4]	40	3
Idaho	5	0
Wyoming	0	4
Colorado	45	11
New Mexico	24	19
Arizona	17	44
Utah [2]	84	217
Nevada	9	--------
PACIFIC		
Washington	78	32
Oregon	10	56
California	400	246
Total	4,448	3,434
10 weeks	42,226	28,701

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Mar. 8, 1941, 23 cases as follows: Kansas, 1; Virginia, 1; South Carolina, 1; Georgia, 10; Florida, 2; Alabama, 1; Texas, 7.
[4] Rocky Mountain spotted fever, week ended Mar. 8, 1941, cases: Montana, 1.
[5] Delayed reports of approximately 150 cases included.

WEEKLY REPORTS FROM CITIES

City reports for week ended February 22, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	143	1,050	143	4,824	932	2,000	30	387	19	1,108	-------
Current week [1]	76	973	81	11,442	569	1,138	2	328	17	1,238	-------
Maine:											
Portland	0	------	0	1	3	1	0	0	0	6	19
New Hampshire:											
Concord	0	------	0	0	1	0	0	0	0	0	12
Manchester	0	------	0	0	2	3	0	1	0	0	18
Nashua	0	------	0	0	0	0	0	0	0	0	9
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	0	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	0	------	2	133	16	39	0	9	1	60	232
Fall River	0	------	0	2	1	6	0	2	0	3	34
Springfield	0	------	0	1	2	3	0	1	0	0	35
Worcester	0	------	0	83	3	6	0	1	0	4	47
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	1	0	16
Providence	0	------	0	0	6	2	0	4	0	18	68
Connecticut:											
Bridgeport	0	5	0	0	2	6	0	0	0	6	34
Hartford	0	1	0	1	1	2	0	0	0	3	48
New Haven	0	3	0	2	0	7	0	0	0	12	45
New York:											
Buffalo	0	------	2	62	8	22	0	5	0	13	132
New York	22	162	4	4,072	119	209	0	69	3	133	1,632
Rochester	0	------	0	8	4	2	0	1	1	5	71
Syracuse	0	------	0	0	3	0	0	0	0	13	46
New Jersey:											
Camden	0	1	1	33	2	7	0	1	0	2	29
Newark	0	38	0	276	14	41	0	4	0	15	99
Trenton	0	6	1	12	2	68	0	1	0	2	58
Pennsylvania:											
Philadelphia	2	9	2	1,300	41	101	0	24	4	70	534
Pittsburgh	0	13	6	37	12	5	0	7	0	42	175
Reading	0	------	1	235	3	0	0	1	0	8	38
Scranton	0	------	------	5	------	1	0	------	0	2	------
Ohio:											
Cincinnati	0	6	1	47	5	15	0	3	0	4	136
Cleveland	1	105	4	1,329	17	34	0	4	0	102	196
Columbus	0	1	1	35	2	15	0	4	0	48	80
Toledo	0	1	0	17	8	5	0	4	0	14	96
Indiana:											
Anderson	0	------	0	2	1	0	0	0	0	0	15
Fort Wayne	0	------	0	28	4	4	0	1	0	0	23
Indianapolis	1	------	2	73	13	30	0	3	0	5	112
Muncie	0	------	0	2	2	9	0	0	0	0	14
South Bend	0	------	0	5	3	1	0	0	0	0	23
Terre Haute	0	------	0	1	7	1	0	0	0	0	26
Illinois:											
Alton	0	------	------	0	2	3	0	------	0	0	------
Chicago	13	15	5	1,777	39	172	0	36	3	32	780
Elgin	0	------	0	59	1	0	0	0	0	0	21
Moline	0	------	0	18	0	0	0	0	0	0	5
Springfield	0	3	1	0	3	3	0	0	0	5	22
Michigan:											
Detroit	1	18	3	968	13	94	0	18	0	147	290
Flint	0	------	0	28	1	2	0	0	0	3	30
Grand Rapids	0	------	0	97	0	6	0	1	0	8	27
Wisconsin:											
Kenosha	0	------	0	37	0	0	0	0	0	3	12
Madison	0	------	0	3	0	1	0	0	0	0	18
Milwaukee	1	2	1	54	11	19	0	5	0	52	121
Racine	0	------	0	0	0	6	0	1	0	3	11
Superior	0	------	0	0	0	2	0	0	0	0	6

[1] Figures for Barre estimated; report not received.

City reports for week ended February 22, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Minnesota:											
Duluth	0		0	0	2	0	0	0	0	4	21
Minneapolis	0	51	0	2	6	9	0	1	0	12	105
St. Paul	0	2	2	0	7	3	0	0	0	6	64
Iowa:											
Cedar Rapids	0			0		2	0		0	0	
Davenport	0			1		3	0		0	0	
Des Moines	1			0		5	0		0	0	27
Sioux City	0			1		0	0		0	6	
Waterloo	0			4		0	0		0	2	
Missouri:											
Kansas City	0	1	2	5	6	5	0	2	0	18	101
St. Joseph	1		0	3	8	0	0	1	0	2	23
St. Louis	6	7	0	17	16	47	0	3	0	23	198
North Dakota:											
Fargo	0		0	0	0	2	0	0	0	17	4
Grand Forks	0			0		0	0		0	0	
Minot	0			1		0	0		0	0	9
South Dakota:											
Aberdeen	0			0		2	0		0	0	
Nebraska:											
Lincoln	0			1		6	0		0	2	
Omaha	1		0	1	5	3	0	1	0	0	52
Kansas:											
Lawrence	0		0	12	0	0	0	0	0	2	3
Topeka	0		0	18	5	0	0	0	0	7	26
Wichita	0	5	0	0	4	0	0	1	0	16	42
Delaware:											
Wilmington	0		0	108	0	4	0	0	0	0	32
Maryland:											
Baltimore	1	25	7	31	18	26	0	14	0	62	220
Cumberland	0		0	0	0	0	0	0	0	0	10
Frederick	0		0	0	1	1	0	0	0	0	4
Dist. of Col.:											
Washington	1	18	1	59	14	18	0	12	0	7	171
Virginia:											
Lynchburg	1		0	1	0	0	0	0	0	0	13
Richmond	1		0	19	4	6	0	0	0	0	46
Roanoke	0		0	121	0	1	0	0	0	3	21
West Virginia:											
Charleston	0	1	1	53	3	3	0	0	0	2	33
Huntington	1			1		0	0		0	0	
Wheeling	0		0	0	0	0	0	1	0	0	22
North Carolina:											
Gastonia	0			3		0	0		0	5	
Raleigh	0		1	48	5	1	0	0	0	16	23
Wilmington	0		1	10	1	0	0	0	0	1	14
Winston-Salem	1		2	2	0	2	0	0	0	29	17
South Carolina:											
Charleston	0	50	1	24	3	0	0	0	1	1	24
Florence	0	3	0	0	0	0	0	0	0	0	5
Greenville	0		0	13	0	0	0	0	0	11	16
Georgia:											
Atlanta	0	8	0	19	4	6	0	5	0	4	70
Brunswick	0		0	1	2	0	0	1	0	0	4
Savannah	0	38	3	4	1	0	0	2	0	0	28
Florida:											
Miami	0	15	0	1	1	0	0	2	0	1	49
Tampa	0	1	0	0	2	0	0	0	0	0	34
Kentucky:											
Ashland	0		0	1	0	2	0	0	0	0	4
Covington	0	1	0	6	4	0	0	0	0	0	16
Lexington	0		0	11	2	0	0	1	0	0	20
Louisville	0	3	0	49	8	39	0	1	0	11	84
Tennessee:											
Knoxville	0		4	19	2	6	0	2	0	15	29
Memphis	0	11	2	33	4	4	0	6	1	15	83
Nashville	0		1	12	4	6	0	1	0	14	52
Alabama:											
Birmingham	0	37	5	44	12	2	0	5	0	3	81
Mobile	2	11	0	5	1	0	0	0	0	0	26
Montgomery	0	8		12		1	0		0	0	
Arkansas:											
Fort Smith	0			1		0	0		0	0	
Little Rock	0	10	1	1	7	0	0	5	0	2	64
Louisiana:											
Lake Charles	0		0	0	1	0	0	0	0	0	11
New Orleans	0	9	1	0	10	6	0	9	1	0	141
Shreveport	4	1	0	0	3	0	0	3	0	5	32

City reports for week ended February 22, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	22	0	1	2	1	0	1	0	3	43
Tulsa	3		0	1	6	0	0	0	0	2	31
Texas											
Dallas	0	2	2	3	5	11	0	6	0	4	71
Fort Worth	0		1	123	4	3	0	2	0	2	52
Galveston	0		0	0	1	0	0	1	0	0	17
Houston	0	1	2	0	4	2	1	4	0	0	75
San Antonio	0	5	4	0	9	0	0	6	0	0	87
Montana:											
Billings	0		0	0	1	0	0	0	0	0	10
Great Falls	0	2	0	0	1	0	0	0	0	0	8
Helena	0		0	0	0	0	0	0	0	0	4
Missoula	0	2	0	0	1	2	0	0	1	0	6
Idaho:											
Boise	0		0	0	1	0	0	0	0	0	7
Colorado:											
Denver	10	22	2	27	5	3	1	6	0	28	74
Pueblo	0		0	0	0	1	0	0	0	0	10
New Mexico:											
Albuquerque	0		0	0	2	0	0	3	0	0	13
Utah:											
Salt Lake City	1			1		0	0		0	7	30
Washington:											
Seattle	3		2	8	3	6	0	4	0	13	98
Spokane	0		0	8	2	3	0	0	0	0	23
Tacoma	0		0	0	2	0	0	0	0	3	36
Oregon											
Portland	0	2	2	10	6	1	0	1	1	0	82
Salem	0			0		0	0		0	6	
California:											
Los Angeles	0	43	1	11	5	16	0	12	1	30	358
Sacramento	2		0	1	1	2	0	1	0	1	28
San Francisco	0	222	0	5	9	6	0	8	0	56	186

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				South Carolina:			
Boston	1	0	0	Charleston	1	0	0
Worcester	1	0	0	Florence	0	2	0
New York:				Tennessee:			
New York	1	1	1	Nashville	0	1	0
Pennsylvania:				Alabama:			
Philadelphia	1	0	0	Birmingham	1	0	0
Ohio:				Louisiana:			
Cleveland	0	1	0	Shreveport	0	2	0
Toledo	0	0	1	Texas:			
Michigan:				Dallas	0	1	0
Flint	1	0	0	California:			
				Los Angeles	0	0	2

Encephalitis, epidemic or lethargic.—Cases: Topeka, 1; Denver, 2.
Pellagra.—Cases: Charleston, S. C., 1; Savannah, 2.
Typhus fever.—Cases: Atlanta, 1; Savannah, 1; Mobile, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—Rats proved positive for plague have been found in Hawaii Territory as follows: 1 rat on February 4 and another rat on February 5, both at Kalopa Homesteads, Paauhau area, Hamakua District, Island of Hawaii, and 1 rat on February 11 and another rat on February 18, both found about 8½ miles from Kahului, Island of Maui.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 1, 1941.—During the week ended February 1, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	5		7	8		2		10	33
Chickenpox		3	10	138	334	28	31	24	107	675
Diphtheria		17		44	2	6	3		1	73
Dysentery				5						5
Influenza		3			469	1			176	649
Measles	1	111	144	173	593	224	235	351	575	2,407
Mumps				90	201	26	5	16	38	376
Pneumonia	3	7			22	2	3		16	53
Scarlet fever		22	10	109	152	7	10	9	21	340
Trachoma							1		1	2
Tuberculosis		1	7	61	47		8			124
Typhoid and paratyphoid fever			2	11	1		2			16
Whooping cough				146	236	11	42	11	25	471

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended June 29, 1940.—During the 13 weeks ended June 29, 1940, cases of certain communicable diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	8,979	Puerperal pyrexia	1,983
Dysentery	555	Scarlet fever	11,823
Ophthalmia neonatorum	1,207	Typhoid and paratyphoid fever	808
Pneumonia	9,345		

England and Wales—Vital statistics—Second quarter 1940.—The following vital statistics for the second quarter ended June 30, 1940, for England and Wales are taken from the Quarterly Return of Births,

Deaths, and Marriages, issued by the Registrar General, and are provisional:

	Number	Annual rate per 1,000 population		Number	Annual rate per 1,000 population
Live births	166, 537	16.2	Deaths from:—Continued		
Stillbirths	5, 969	.58	Influenza	1, 107	.11
Deaths, all causes	118, 055	11.8	Measles	153	.02
Deaths under 1 year of age	7, 681	[1] 46	Scarlet fever	35	.00
Deaths from:			Typhoid and paratyphoid fever	23	.00
Diarrhea and enteritis (under 2 years of age)	604	[1] 3.6	Whooping cough	103	.01
Diphtheria	398	.04			

[1] Per 1,000 live births.

NOTE.—The above deaths include only civilians.

JAMAICA

Communicable diseases—4 weeks ended February 15, 1941.—During the 4 weeks ended February 15, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	10	11	Puerperal sepsis		8
Diphtheria		3	Scarlet fever		1
Dysentery	4	6	Tuberculosis	30	60
Leprosy		1	Typhoid fever	13	42

SWEDEN

Notifiable diseases—November 1940.—During the month of November 1940, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	1	Poliomyelitis	30
Diphtheria	19	Scarlet fever	1, 199
Dysentery	19	Syphilis	27
Epidemic encephalitis	1	Typhoid fever	2
Gonorrhea	805	Undulant fever	11
Paratyphoid fever	39		

VENEZUELA

Poliomyelitis.—According to information dated January 31, 1941, 85 positive cases of poliomyelitis had been reported in Caracas and elsewhere in Venezuela since October 1940. The cases reported by months are as follows: October, 5; November, 11; December, 26; January 1–30, 1941, 43. The mortality was said to average about 11 percent.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of February 28, 1941, pages 416–420. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Argentina—Cordoba Province.—During the month of January 1941, 1 case of plague was reported in Cordoba Province, Argentina.

New Caledonia—Goro.—A report dated March 3, 1941, states that 7 cases of human plague with 6 deaths have occurred at Goro at the north end of the island of New Caledonia.

Peru.—During the month of December 1940, plague has been reported in Peru as follows: Libertad Department, 1 case; Lima Department, 1 case, 1 death; Piura Department, 3 cases, 2 deaths; Tumbes Department, 1 case, 1 death.

On vessel—S. S. Urumba.—A fatal case of plague has been confirmed in a stowaway on the S. S. *Urumba* arriving at Valparaiso, Chile, from Peru on February 11, 1941.

Yellow Fever

Colombia.—Yellow fever has been reported in Colombia as follows: Boyaca Department, January 7–22, 1941, 3 deaths; Cundinamarca Department, December 1–31, 1940, 1 death; Intendencia of Meta, November 18, 1940, 1 case; Intendencias and Commissaries, December 1–31, 1940, 4 deaths; Santander Department, January 13, 1941, 1 death; Tolima Department, December 1–31, 1940, 6 deaths, January 17, 1941, 1 death.

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Public Health Reports

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Three New Species of Ticks From the United States

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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WAR AND INFECTIOUS DISEASE[1]

By Clara E. Councell, *Junior Statistician, United States Public Health Service*

CONTENTS

The waging of war has always been attended by increases in the prevalence of disease. The rapid and extensive spread of infection is to be expected under the conditions brought about by the struggles between nations. The concentration and movement of large bodies of men from various parts of the world; the limitless hardships, with fatigue, general malnutrition, famine and exposure; and the lack of medical care, sanitation, and personal hygiene often experienced by civilians and soldiers alike provide the fuses for the explosion of widespread epidemics. Refugees and captured and returning prisoners are important instruments in the transmission of disease from enemy to enemy and to all civilian groups. While certain types of sickness have accompanied armies throughout the centuries, there have nevertheless been some notable changes in the prevalence and severity of wartime affections. It is only in comparatively recent wars that more men have been lost from military action than from disease. The ratio of the disease death rate to the battle death rate among United States troops was 7 to 1 in the Mexican War and 5 to 1 in the Spanish War. The Germans in the Franco-Prussian War of 1870 and the Japanese and Russians in the Russo-Japanese War of 1904 show the first records in which the mortality for the wounded was higher than for those stricken with infectious disease.

The true degree of relationship between war conditions and the unusual prevalence of disease must be, to some extent, a matter of conjecture. It is doubtful whether the pandemic of syphilis at the end of the fifteenth century can be entirely explained by its dissemination by soldiers throughout Italy, France, and Germany. It has been suggested that the spread of virulent smallpox throughout

[1] From the Division of Public Health Methods, National Institute of Health. The writer is greatly indebted to Dr. S. D. Collins for valuable suggestions and criticism.

Europe after 1870 cannot be explained wholly by the events of the Franco-Prussian War. The prevalence of cerebrospinal meningitis in 1918–19 and 1939–40 may be interpreted as evidence of a wave in epidemicity that would have manifested itself in the absence of the contributing factors present in wartime. It is, however, obvious that usually mild diseases may flare up with unparalleled activity and, fanned by the abnormal circumstances of living, may rage with uncontrollable fury. It is difficult to judge, currently or in retrospect, the extent of specific causes of illness, as the general onslaught of infections makes precise diagnosis difficult if not entirely impossible. The similarity and overlapping of the symptoms of various diseases suggest simultaneous attacks of more than one of the usually recognized entities and may easily result in the incorrect allocation of many cases. While this may be especially true of the epidemics described by the early historians, it is not limited to the experience of past centuries. There is evidence, for example, that at the time of the war of 1914–18 cases of typhoid fever were undoubtedly included in the horde of sufferers from the influenza pandemic (*15b*). It is impossible to show the true prevalence of the epidemic diseases of early or even of modern wars, and the number of cases reported must often represent only a fraction of the total. No attempt has been made here to relate epidemic spread to specific troop movements and similar wartime events, but some of the records available have been utilized to show which affections appear to have been of primary importance and to what degree. The data here collected are but a few examples from the awesome toll of wartime sickness.

WAR AND INFECTIOUS DISEASE BEFORE 1914

Knowledge of early pestilences is dependent entirely upon the historian's powers of estimation and description. Only a blurred picture can be obtained of the true character and incidence of the great waves of fatal illness that decimated the nations involved in early wars. Ignorance concerning the transmission of the common diseases and of the principles of health protection made the people particularly vulnerable to mass attack. Nevertheless, from all of the evidence presented, it appears that much of the extensive damage wrought in the past can be ascribed to diseases identifiable today.

Typhus fever was prevalent through ancient times and the Middle Ages (*18*). After Fracastori's clear description early in the sixteenth century, this disease is readily traceable in wars in southern Europe and in Germany and Austria-Hungary. During the Thirty Years' War (1618–48) in which most of Europe became involved, it accompanied the armies in the East. It was present during the War of the Polish Succession (1733–35), and occurred among troops in the Seven Years' War (1756–63) when Austria, France, Russia, and Sweden were

aligned against Prussia and England. The French Revolution of 1789 and the Napoleonic Wars (1805–14) were followed by the most severe epidemic in the history of Europe. Typhus spread generally even to sections far removed from siege and battle, although the disease was always more severe in the war area. It again played great havoc in the Russo-Turkish War of 1877–78. The simultaneous occurrence of epidemics of typhus and of relapsing fever has long been recognized.

Galen has described a pestilence of unmistakable smallpox. Beginning in the Roman Army in A. D. 166, it spread over the whole of Italy and into Gaul, resulting in the death of more than half of the population and almost all of the troops (*10g*). The Arabian physician Rhazes described the disease accurately in the ninth century and it seems to have been reintroduced again and again from the East by the returning Crusaders. Smallpox was apparently brought into the New World by the discoverers of America and took a large toll of the native tribes. In the following centuries severe epidemics were frequent in the Eastern and Western Hemispheres until they moderated after the introduction of vaccination at the end of the eighteenth century. Armies and civilians suffered greatly from smallpox during the American Civil War (1861–65). At the time of the Franco-Prussian War it was very prevalent among the French, but few of whom had been vaccinated, although there was little among the better protected German Army. War prisoners carried the epidemic to Germany where a large part of the population was not vaccinated, and no nineteenth century epidemic could compare in extent and virulence with that which raged after 1870 throughout Germany, Belgium, Switzerland, the Netherlands, Austria, England, and America, to which it was brought by immigration (*16*).

Typhoid fever has not been described as such in the records of early wars but it has undoubtedly been one of the leading scourges. It was apparently the most fatal disease of the American Civil War, and was very common in the Franco-Prussian War when it spread throughout France, in the Russo-Turkish War of 1877–78, and in the Boer War of 1899–1902 between the British and Dutch. During the Spanish-American War (1898) the incidence rate was 142 per 1,000 per annum (*15b*). Large numbers of soldiers contracted typhoid, diarrhea, and dysentery in the Russo-Japanese War of 1904.

Dysentery is described in Hindu records of 3,000 years ago, and was well known to the early Greeks and Romans. It was differentiated from diarrhea by Hippocrates. The armies of the Crusades, in the thirteenth century, suffered greatly from dysentery. Records indicate that this disease was especially widespread during the Thirty Years' War and the Franco-Prussian War and killed thousands of French and British soldiers in the Crimean War (1853–56) involving Turkey, Great Britain, and France against Russia. While difficulties of dif-

ferentiation make figures for dysentery particularly inaccurate, some indication of its importance may be gleaned from the following reports of its incidence and fatality in the past (*10a*):

War	Reported number of—	
	Cases	Deaths
Franco-German (1870-71) (German Army)	38,652	2,380
South African campaign (1899-1902)	38,108	1,342
Sino-Japanese War (1894)	155,140	38,094

Diarrhea and dysentery of an unusually fatal character were responsible for large numbers of deaths among American Civil War soldiers.

Records of war fought in regions where malaria was endemic indicate its high and fatal attack rate. It was of unusual severity when Napoleon besieged Mantua, a town of northern Italy, in 1796–97 and during the Italian Revolutionary War of 1859. Over half of the American Civil War troops acquired malaria (*16*).

The parallelism of the war of 1914–18 and the influenza pandemic have made this disease of significance as one that may be exacerbated by wartime conditions. Accounts of early epidemics refer to the occurrence of a disease that was apparently identical with or closely allied to influenza. Some historians so identify the pestilence of 412 B. C., mentioned by Hippocrates and Livy and this diagnosis may be applied to numerous epidemics occurring after the sixth century, such as the English sweating sickness of 1486. Pandemics of influenza readily identifiable as such occurred in the sixteenth and eighteenth centuries, with recurrences in 1830–33, 1836–37, 1847–48, and 1889–90 (*19*).

Two of the diseases which formerly took a large toll in times of war have apparently become of less importance. Bubonic plague in the twelfth century devastated the soldiers of Frederick Barbarossa in his Italian campaigns, as well as the population of Rome and surrounding territory occupied by the armies. It was perhaps the most prevalent disease of the Thirty Years' War and was severe in all Europe throughout the Middle Ages. It was epidemic during the Russo-Turkish Wars of 1768–74 and 1827–29, but in later years it has not played a major role among war pestilences. With generally improved sanitation cholera also has declined in importance. It was exceptionally common at the time of the Crimean War, when it spread over all of France, and scattered from the Crimea over a large part of eastern Europe. At the time of the German-Austrian War of 1866 about 100,000 persons died of cholera in Germany. Extremely low incidence followed the practice of inoculation by the Japanese in 1904 and by

the Greek Army in the Balkan War (1912–13) between Turkey and the allied armies of Bulgaria, Greece, Montenegro, and Serbia.

INFECTIOUS DISEASE AMONG CIVILIANS DURING AND AFTER THE WAR OF 1914–18

The experience of the war of 1914–18 has the recurring theme of epidemic diseases of the past. The distress of earlier times was paralleled by the experience of Russia in the period during and after the war and revolution. The resulting famine throughout Russia, unequaled since the time of the Thirty Years' War, was accompanied by cholera, dysentery, malaria, typhoid, typhus, and relapsing fever. Throughout the country there was a lack of food, drugs, and fuel; many hospitals were closed, and in others all types of patients were crowded together, often more than one person in a bed. A constant flow of refugees filled the roads, the stations, and all means of transportation, and epidemics followed the lines of railways and waterways. The suffering of the people was intense, especially in the eastern and southern parts of the country, and their situation became increasingly desperate in the post-war years.

Cholera appeared in epidemic form in the Ukraine, a southern district of European Russia, in December 1920, flared high in 1921, when 176,885 cases were officially notified, and again in 1922. Before the war there were annually about 80,000 cases of typhus and 30,000 of relapsing fever reported in Russia, with typhus ranging from a low of 36,887 in 1897 to about 180,000 cases in the famine years of 1892 and 1909. Typhus became increasingly serious after 1917 and in the epidemic of 1919–20 there were nearly 5,000,000 cases of typhus and 1,260,000 of relapsing fever recorded for the civilian population (*12b*). A recession in 1921 was followed by great increases in typhus and relapsing fever, as well as cholera, in 1922. Typhoid and dysentery were also extremely prevalent. Tarassevitch quotes the following figures for the years 1918 through 1921 (*12c*):

	1918	1919	1920	1921
Typhoid fever	109, 624	252, 066	424, 481	406, 389
Dysentery	59, 750(?)	137, 169(?)	324, 389	220, 093

The queries are his and he comments that the figures are certainly very incomplete. He concludes that typhoid fever and the dysentery group were of greater prevalence than before the war but in comparison with that of typhus and relapsing fever their increase is only very slight.

Malaria was one of the most widespread diseases in the country, but was so incompletely reported that it is practically impossible to

estimate its extent. It was apparently the unanimous opinion of doctors that malaria greatly increased throughout the country during and after the war years.

Figures available for the first 9 months of 1921 indicate the comparative prevalence and completeness of reporting in European Russia. The Red Army constituted only about 1 percent of the total population. While preventive inoculation and the special conditions of army life complicate any comparison, there is nevertheless strong evidence that all of these diseases, and particularly relapsing fever, were grossly underreported for civilians.

Number of cases reported in European Russia, Jan.–Sept. 1921 (12a)

	Red Army	Railways [1]	Other cases (European Russia civilian population) [2]	Total	Red Army as percent of total
Typhus	61,984	19,751	330,178	411,913	15 0
Typhoid fever	16,248	14,619	150,445	181,312	9 0
Dysentery	16,049	12,447	162,549	191,045	8 4
Relapsing fever	258,670	36,003	270,313	564,986	45 8
Asiatic cholera	2,836	19,328	100,893	123,057	2 3

[1] It is not clear whether this refers to travelers or to railway personnel and their families.
[2] Excluding Ukrainia.

In 1918 influenza spread over Russia. There were marked increases in tuberculosis, in other infections of the respiratory tract, and the venereal diseases, as well as milder outbreaks of infectious jaundice, encephalitis lethargica, scabies, tinea, and trachoma. Apparently all affections except the common communicable diseases of children showed greater distribution and prevalence.

The organization of strong public health defenses upon the Polish and southern borders aided in preventing the spread of disease throughout Europe by refugees escaping from the famine zones of Russia. By 1918 there was a great migration of Polish prisoners of war and civilian refugees well under way. About 468,000 persons returned to Poland in 1921 and in each month of the summer and autumn between 50,000 and 60,000 persons passed through the quarantine station at Baranowicze, near the Russian border of Poland. During 1 month almost 1,500 deaths occurred among persons arriving at the station (*12a*). Records of hospital admissions among the repatriates showed an even greater incidence of dysentery, malaria, and relapsing fever than of typhus, in addition to a high proportion of cases of measles and pulmonary tuberculosis.

From the beginning of the war of 1914–18 all Poland had been a battlefield and epidemics followed on the heels of the many armies with which it was overrun. In Poland, as well as Russia, typhus was continually present. It appeared in epidemic form in 1916 and reached a peak in 1919 and 1920. The number of cases declined

during the summer months but rose with new intensity each fall and increased greatly over those of pre-war years (*11a*):

Year:	Number of deaths from typhus fever
1911	426
1916	3,480
1917	3,776
1918	7,655
1919	19,891
1920	22,565

In Congress Poland and Galicia, post-war districts of eastern and southern Poland, there was an average of about 2,000 cases per year reported for the period 1905 through 1911. In 1919–20 the annual incidence had risen to about 200,000 cases, or 100 times the number reported in the earlier years. It has been estimated that in these sections, in the month of January 1920, there were at least 40,000 cases of typhus, with about 100,000 cases in all Poland. After some decline typhus flared up again in the winter of 1921–22, after which the recession was continuous for 10 years or so. The typhus increase was accompanied by a rise in the number of cases of relapsing fever, with about 14,000 cases reported in 1921.

Many other diseases, perhaps originating in Bolshevik prisoners' camps, spread to the army and the civilian population of Poland. Between 1895 and 1915 the records show only 3 instances of the appearance of cholera in Galicia, with 459 deaths in one outbreak in 1895, 19 in 1896, and 1 imported case in 1910. In 1915, coincident with the advance of the Russian Armies, there was a violent flare-up with more than 30,000 cases and 17,252 deaths (*11a*).

There were recurring epidemics of cholera; dysentery, typhoid fever, and smallpox were everywhere. Measles and scarlet fever also accompanied many of the refugee children (*11b*).

Number of cases notified in Poland in 1919 and 1920 (*11a*)

	1919	1920
Typhus fever	234,938	157,612
Dysentery	15,304	32,938
Typhoid fever	12,246	20,868
Smallpox	1,862	3,746

The summer and autumn of 1920 witnessed a considerable increase in the incidence of dysentery. It had been particularly virulent in 1914–15 in western Galicia and in 1917 in Congress Poland. The infection was apparently transported from this area, with the German troops, to south Hungary and Serbia.

Early in 1919 investigations of the serious epidemic conditions of eastern Europe were initiated by the League of Red Cross Societies, and, with the organization of the Epidemic Commission of the League

of Nations in 1920, determined efforts were made to control the epidemic crises.

Of the rest of Europe, only Serbia suffered from epidemics such as those of Russia and Poland. Weakened by the Balkan Wars immediately preceding the war of 1914–18, Serbia was an easy victim of epidemic disease. Typhus spread to all parts of the country from the wounded, sick, and imprisoned Austrians, particularly at Valjevo, in northern Serbia. At the same time relapsing fever was widespread and typhoid fever increased. Records of incidence are lacking, but the Serbian typhus outbreak of 1915 probably attacked at least 1 in every 5 persons, with a case fatality of from 30 to 70 percent, and in less than 6 months over 150,000 people died of typhus (*18*). In the spring of 1915 Serbia organized a vigorous campaign against typhus, with aid from the United States, France, Great Britain, Belgium, and Holland; and by August the epidemic had waned, not to reappear.

Statistics for the post-war period indicated that the epidemic prevalence of typhus and relapsing fever accompanied repatriates through the eastern area (*12b*), in Estonia, Latvia, Lithuania, Rumania, Turkey, and Yugoslavia (the Serb-Croat-Slovene Kingdom). The peak of the epidemic in eastern Europe occurred in 1919 and 1920. It has been estimated that among the 115 million people of European Russia and the Ukraine there were 3,000,000 cases in 1920 and among the combined population of about 55 million in Rumania, Poland, Lithuania, Latvia, and Estonia there were 225,000 cases of typhus.

Estimated number of cases of typhus fever (13a)

Year	European Russia and the Ukraine	Other parts of eastern Europe
1920	3,000,000	225,000
1921	550,000	62,000
1926	50,000	6,500
1931	15,000	4,000

Among the Austrian civilian population more than 13,000 cases of typhus occurred in 1915 and over 12,000 in 1916. Cases of typhus and relapsing fever also appeared in some districts of Germany, chiefly among prisoners of war. Although there was general infestation with lice among soldiers and civilians on the western front, for some reason that has never been evident these areas were strikingly free of typhus and relapsing fever.

In the years during and after the war of 1914–18 smallpox flared up in all parts of the world. After the passage of a compulsory vaccination law in Germany in 1874 the disease was relatively quiescent until it became epidemic in north Germany in 1917. The 2,400 cases then reported were the largest number on record. In 1915–16 smallpox

was violently epidemic in Austria-Hungary, where about 50,000 cases occurred. More than 42,000 of these cases were in the two Provinces of Galicia and Bukowina, from which the infection was carried to the larger cities, including Vienna, Prague, and Budapest (*10c*).

Italy had an annual average of 700 cases for 1914–16, but in 1919 and 1920 there were respectively 34,365 and 26,543 cases (*8*). In England and Wales there were only 7 cases of smallpox reported in 1917. In 1918 there were 63 cases and in the next 5 years the numbers were 311, 280, 336, 973, and 2,504. The recrudescence was not limited to the war zone, for the United States had an annual average of 28,000 cases for 1909–14, but there were 56,332 cases reported in 1919, 96,684 in 1920, and 102,787 cases with 641 deaths in 1921. The registration area of British India reported great increases in 1919 and 1920 and Australia was invaded by smallpox between 1914 and 1918 and again in 1921.

Tuberculosis mortality showed marked increases during and immediately following the war of 1914–18. In a world where control measures were at a standstill, during a period when living conditions would in every way encourage the spread of infection, and when the influenza toll was great, the death rate from tuberculosis showed the dramatic rise that was to be expected.[2] Not only in Germany, England, Belgium, the Netherlands, Italy, and Austria but also in the United States and Japan the wartime peak was evident (*21*). If data were collected for France and other warring countries, it is to be expected that they would show a similar picture.

In 1917 the Polish cities of Warsaw, Cracow, and Lodz had tuberculosis death rates of, respectively, 840, 908, and 1,164 per 100,000 population (*4*). In Vienna this rate increased from 278 in 1914 to 490 in 1919. In Berlin the pre-war rate of 156 in 1913 was almost doubled by the 1917 rate of 292. In the 15 years preceding the war, the death rate from all forms of tuberculosis in the Prussian district of Germany fell from 219 per 100,000 population in 1899 to 142 in 1914. During the war years it rose to 230 in 1918 and was again high in the inflation period 1922–23. In Belgium the death rate increased from 118 per 100,000 population in 1913 to 245 in 1918. The rapid decline of tuberculosis after the war has been explained by the fact

[2] The increase in tuberculosis reflects generally impaired nutrition in the years during and after the war. The limitation of this paper to infectious disease neglects any relationship between war and other types of sickness. Periods of famine also result in the disturbance of growth, particularly in very young children, and in the increased prevalence of the deficiency diseases, such as beriberi, pellagra, rickets, and scurvy. In the Moscow industrial and the central agricultural districts of Russia there were 5,317 cases of scurvy reported in 1914–15 and 55,972 in 1920–21. Increases in child and maternal mortality have been noted. During and after the war of 1914–18 there was a large amount of disability from nervous and mental disorders in the fighting forces. Opinion is at present divided regarding the effect of air raids upon the incidence of mental disorders in the civilian population. It has been suggested that the stresses and strains of war may raise the morbidity and mortality from diseases of the heart and blood vessels. Industrial fatigue is an important element of wartime. In general, anxiety, fatigue, and the lowering of the standard of living may reduce resistance to disease and may result in the impairment of mental and physical functions and organs of the body.

that many acutely infectious cases were wiped out in the influenza pandemic, a situation somewhat comparable to the decline of leprosy in Europe after the ravages of the Black Death.

After the beginning of hostilities malaria reappeared in the Emden district, in the northeastern corner of Germany, where it had been rare since 1890. The increase was ascribed chiefly to the neglect of canals and drainage systems. Dysentery is known to have been epidemic in Austria and in Germany, especially in Prussia. During the first 7 months of 1917 there were more than 4,000 cases in Austria, while in Prussia there were about 13,000 cases among civilians. The epidemic was apparently introduced from the armies, in which it was even more severe (*10c*).

Cerebrospinal meningitis [3] was widespread and fatal, not only in the war zone but also in other parts of the world. Figures for Austria show 3,226 cases with 1,601 deaths in the 4 years 1915–18, inclusive. In the last 6 months of 1915 alone there were 222 cases with 107 deaths. In England this disease maintained a prevalence hitherto unequaled. In the wartime epidemic period of 1914–18 there were 6,450 cases reported among civilians in England and Wales and 4,238 cases among military personnel (*3b*).

Outbreaks of encephalitis lethargica were noted among British and French civil and military populations in 1917–18. The disease swept various European countries at different times and attained its highest incidence in and after 1920. In the United States and most of Europe a decline was evident after 1924 (*13b*).

Association with influenza has been noted in the occurrence of cerebrospinal meningitis, encephalitis lethargica, and other epidemic diseases of the central nervous system. At the end of the war of 1914–18 influenza completely overshadowed all other diseases in importance, and in extent and virulence was comparable to the plagues of early history. The occurrence of the pandemic of 1918–19 may have been coincidental with, but was certainly exacerbated by, the conditions of wartime and its aftereffects. Both incidence and mortality are matters of estimate. The marked increases in the death rate for all causes were everywhere greater than the rise in influenza and pneumonia death rates. The excess noted in the mortality from bronchitis, pulmonary tuberculosis, heart disease, certain puerperal causes, and nephritis in the United States suggests that the effect of epidemic influenza upon the population cannot be shown by consideration of influenza-pneumonia mortality alone. Jordan (*9*) has estimated the total mortality from the influenza pandemic to have been nearly 22,000,000 persons, distributed as follows:

[3] Wherever this category is discussed it presumably refers to disease due to meningococcus infection, as in item No. 6 of the International List of Causes of Death (1938 revision), but because of confusion and incomplete statements of etiology the content may vary and it may include a number of cases not of meningococcic origin.

Total mortality, influenza pandemic, 1918

	Number of deaths
North America	1,076,000
South America	327,000
Europe	2,163,000
Asia	15,757,000
Australia and Oceania	965,000
Africa and Madagascar	1,354,000
Total	21,642,000

While these figures represent only general approximations it is probable that they do not overestimate the true picture.

Definitive figures for venereal disease are hard to obtain. There was apparently an increase in the civilian population as well as in the armies of Europe (*3a*, *7*, *10b*).

INFECTIOUS DISEASE IN THE FIGHTING FORCES IN THE WAR OF 1914–18

European armies—war of 1914–18.—The armies in western Europe were not harassed by typhus, relapsing fever, and cholera, nor after the early stages of the war by smallpox, dysentery, or typhoid fever. During the war of 1914–18, in contrast to earlier conflicts, more soldiers were killed in battle than died from disease.

Typhus and relapsing fever assumed epidemic proportions only in the armies of Russia, Serbia, and Poland. On both eastern and western battlefronts the general infestation with lice was held responsible for the numerous cases of trench fever which, though of a low fatality, caused much sickness. About one-half of 1 percent of the German troops on the Polish front had cholera, and about 12,000 cases occurred in the army in September 1914. Inoculation is credited with having effected the low fatality rate of 10 percent (*5*). Cholera was prevalent in Turkey and among the fighting forces of Russia, Serbia, and Austria-Hungary, but occurrence among other troops was rare.

The troops for whom vaccination was compulsory were generally free from smallpox. The Austro-Hungarian Army, only partially protected, had many cases. Amebic dysentery was imported to France by the colonial troops, and British forces in the Dardanelles suffered severely with diarrheal diseases. Dysentery was the common disease in the German Army, with more than 155,000 cases and a fatality rate of about 12 percent. It was especially severe among the troops in the eastern campaign (*6*).

Typhoid fever, war of 1914–18 (15b)

Country	Cases		Deaths		Case fatality
	Number	Rate per 1,000	Number	Rate per 1,000	
					Percent
United States [2]	1,572	0.4	233	0.05	14.8
Great Britain	6,807	1.0	260	.04	3.8
France [1]	124,991	14.9	15,211	1.81	12.2
Italy [1 2]	58,451	6.2			
Belgium [2]	3,217	3.6	523	.57	16.3
Germany [2]	112,364		11,405		10.2
Austria	171,601		17,399		10.1

[1] Includes paratyphoid fever.
[2] Reported cases for the United States Army are for the entire period 1914–19, including time before entry into the war. Italy did not enter the war until 1915 and the United States not until the spring of 1917. Figures for the United States and Belgium include cases occurring during 1919. The figures for Germany and Italy do not include cases occurring in 1914.

In 1914 and 1915 the French Army suffered greatly from typhoid fever and in January 1915 there were 13,993 cases with 2,210 deaths. With increasing inoculation the prevalence dropped, until in December 1916 only 323 cases were reported (*17a*). During the first 2 years of the war the French Army had about 110,000 cases of typhoid and paratyphoid fever in comparison with 2,000 for the last 2 years, after the widespread use of triple vaccine.

In the malarious regions of Taranto, in southern Italy, Macedonia, in northern Greece, in Asia Minor, and in East Africa, troops were seriously affected. The British Macedonian Expeditionary Force in 1917 had 71,412 admissions for malaria, with 228 deaths, out of a force of 182,000 men. In the 1917 East African campaign the 50,000 men had over 72,000 admissions, with 499 deaths (*10d*).

Epidemic jaundice was common among armies in all parts of Europe and was very prevalent in Gallipoli at the end of 1915. Cerebrospinal meningitis, as well as influenza and pneumonia, were widespread among all troops after the fall of 1917 and the toll of diseases of the respiratory system was especially high. The French Army in particular suffered severe losses from tuberculosis. Out of a total force of about 8,400,000 men mobilized during the war, 111,000 French soldiers were discharged for tuberculosis between August 1914 and December 1918. Rist (*17b*) has, however, estimated that out of the 86,000 soldiers discharged for this cause during the first year of the war less than 20 percent were really tuberculous. MacNalty (*3b*) reports that about 35,000 men were invalided out of the British services on account of tuberculosis attributable to or aggravated by conditions of service. There was also a rise in the tuberculosis rate for the German Army during the war years.

The belief that venereal disease was much more prevalent among the armies of the war of 1914–18 than in previous times was substantiated by the records of the British, French, German, Austro-Hungarian, and American Armies. One of the most difficult of problems lay in the practice of the men who deliberately acquired venereal disease in order to absent themselves from the trenches for treatment (*10e*).

The experience of the war of 1914–18 shows that the incidence of infectious diseases among the troops was controlled to an extent far greater than in the past by sanitation, hygiene, and preventive inoculation. The German Army was strikingly successful in combating epidemic infections, with a record of 1,531,048 deaths from wounds and 155,013 from disease during 1914–19. Waldman (*20*) contrasts this proportion of 1 death from disease to each 10 for wounds to the less favorable ratios of earlier wars.

United States Army—war of 1914–18 (*15*).[4]—In the United States Army, cholera, typhus fever, smallpox, and malaria played exceptionally unimportant roles among the infections prevalent during the war of 1914–18. Among the communicable diseases the largest numbers of reported primary admissions were for influenza, venereal diseases, mumps, and measles; and influenza, tuberculosis, measles, and cerebrospinal meningitis were leading causes of death. Epidemics were on the whole more extensive in the training camps in this country than in the American Expeditionary Forces.

[4] All data quoted in this section were obtained from the volumes of the Medical Department of the United States Army in the World War unless other references are specified.

Admissions and days lost from duty for certain infectious diseases, U. S. Army,[1] *Apr. 1, 1917–Dec. 31, 1919*

	Primary admissions		Days lost from duty	
	Number	Annual rate per 1,000	Number	Noneffective rate per 1,000 [2]
Respiratory diseases [3]	1,125,401	272.6	17,042,838	11.3
United States	749,004	335.1	9,368,434	11.5
Europe	335,484	201.4	7,306,906	12.0
Influenza	791,907	191.8	10,676,172	7.1
United States	533,649	238.7	6,146,574	7.5
Europe	228,461	137.2	4,296,815	7.1
Bronchitis	255,148	61.8	3,287,643	2.2
United States	169,426	75.8	1,543,152	1.9
Europe	76,975	46.2	1,669,261	2.8
Pneumonia (all)	78,346	19.0	3,079,023	2.0
United States	45,929	20.5	1,678,708	2.1
Europe	30,048	18.0	1,340,830	2.2
Venereal diseases (all)	357,909	86.7	6,804,818	4.5
United States	284,742	127.4	4,745,450	5.8
Europe	57,195	34.3	1,748,067	2.9
Gonococcus infection	251,899	61.0	3,903,303	2.6
United States	211,638	94.7	2,867,491	3.5
Europe	31,199	18.7	891,492	1.5
Syphilis (all)	67,026	16.2	1,927,901	1.3
United States	51,528	23.0	1,345,961	1.6
Europe	12,680	7.6	511,657	.8
Chancroidal infection	39,044	9.5	973,614	.6
United States	21,576	9.6	531,998	.6
Europe	13,316	8.0	344,918	.6
Mumps	230,356	55.8	3,884,147	2.6
United States	141,628	63.4	2,276,544	2.8
Europe	81,853	49.1	1,501,222	2.5
Measles	98,225	23.8	1,877,944	1.2
United States	85,398	38.2	1,600,798	2.0
Europe	9,168	5.5	229,745	.4
Dysentery (all), diarrhea, enteritis and colitis	92,512	22.4	1,060,229	.7
United States	39,854	17.8	232,241	.3
Europe	48,202	28.9	793,972	1.3
Tuberculosis of lungs	33,249	8.0	3,385,053	2.2
United States	27,274	12.2	2,636,722	3.2
Europe	4,877	2.9	677,169	1.1
German measles	17,378	4.2	211,645	.1
United States	16,167	7.2	197,330	.2
Europe	579	.4	8,505	(4)
Malarial fevers (all)	15,555	3.8	194,529	.1
United States	10,510	4.7	130,673	.2
Europe	950	.6	20,477	(4)
Scarlet fever	11,675	2.8	498,190	.3
United States	9,038	4.0	382,628	.5
Europe	2,370	1.4	106,877	.2
Diphtheria	10,909	2.6	317,050	.2
United States	5,884	2.6	144,452	.2
Europe	4,860	2.9	168,100	.3
Meningitis, cerebrospinal (epidemic)	4,831	1.2	268,164	.2
United States	2,878	1.3	150,386	.2
Europe	1,848	1.1	114,110	.2
Chickenpox	1,757	.4	31,534	(4)
United States	1,208	.5	21,443	(4)
Europe	388	.2	7,582	(4)
Typhoid fever	1,529	.4	109,374	.1
United States	546	.2	28,587	(4)
Europe	885	.5	76,649	.1
Smallpox	853	.2	24,275	(4)
United States	780	.4	21,890	(4)
Europe	24	(4)	1,110	(4)
Trench fever	798	.2	34,098	(4)
United States	11	(4)	674	(4)
Europe	786	.5	33,402	(4)

[1] Total mean annual strength = 4,128,479; United States (including Alaska) = 2,235,389; Europe (excluding Russia) = 1,665,796; other (Philippine Islands, Panama, etc.) = 227,294.

[2] Noneffective rate $= \frac{\text{total days lost} \times 1{,}000}{\text{total mean annual strength}} \div 365$.

[3] Respiratory diseases include influenza, bronchitis, lobar and broncho-pneumonia and pneumonia, unclassified.

[4] Rate per 1,000 less than 0.1.

The accompanying table shows, for important infectious diseases, the number of primary admissions and days lost from duty,

with rates, for the United States Army from April 1, 1917, through December 31, 1919, in all areas; in the United States, including Alaska; and in Europe, excluding Russia. The total mean annual strength of these forces was 4,128,479, with 2,235,389 in the United States and 1,665,796 in Europe.

The number of admissions refers to admissions to sick report and includes not only men admitted to hospitals but also those treated either when excused from duty or for ailments probably affecting their future military fitness, as well as all deaths, discharges, and retirements. Only one cause of admission was recorded. Deaths and days lost were ascribed to the original cause of admission, irrespective of subsequent complications. There was a total of 3,515,464 admissions for sickness in the United States Army in the period under discussion, with 62,681,428 days of disability. Rates shown are annual ratios per 1,000 mean strength. The noneffective rate shows the average number of men absent from duty for each day of the year. To obtain it the total days lost were divided by the total mean annual strength, and the quotient was divided by 365 days.

Because of their relative unimportance Asiatic cholera, with a total of 17 admissions and 7 deaths, and typhus fever, with 42 admissions and 3 deaths, are not included in the table.[5] Smallpox accounted for only 853 admissions and 141 deaths. Before the war of 1914–18 the Army smallpox rate had always risen abruptly with the start of war, but for this period both admission and death rates showed little change from the figures for preceding years. Malaria was responsible for a total of 15,555 admissions, of which 10,510 occurred in the Army in the United States. The total number of 36 deaths from malaria is a very low figure for an army in wartime.

Typhoid fever, a primary disabling factor in the Civil and Spanish-American Wars, appears low on the list of important infections of the war of 1914–18. A sharp decline in incidence in the Army, starting in 1910, corresponds with the introduction of compulsory inoculation. For typhoid fever as for smallpox no extreme increase was noted in the wartime records in comparison with those for preceding years. Many of the 546 admissions in the United States occurred prior to inoculation. The American Expeditionary Forces, reporting 885 admissions, had supposedly all been inoculated at some time, but the lapse of time since inoculation, less sanitary surroundings, and increased exposure to infection increased the risk of attack.

Infections of the respiratory tract supplanted the pestilences of earlier wars as leading causes of sickness and death. Influenza, bronchitis, and pneumonia combined were responsible for 1,125,401 admissions and 44,270 deaths, with an annual admission rate of 273

[5] See *15b*, page 483; in *15c*, pages 86 and 134, 2 admissions and 1 death are reported.

per 1,000, a death rate of 11 per 1,000, and a case fatality of 4 percent. Together they accounted for over 17,000,000 days lost from duty. Influenza was apparently more frequent and more fatal in the camps in this country than in the troops abroad. Increased prevalence in the fall of 1918, culminating in the October peak, appeared to run a parallel course in both forces. Data for the Army as a whole show a subsequent decline followed by recurring waves in January and February, June and July, and December, 1919.

Of great importance among causes of sickness and disability was the group of venereal diseases, responsible for 357,969 admissions to sick report, or slightly more than 10 percent of the total recorded, and with a loss of nearly 7,000,000 days from duty. The comparatively high rate for the Army in the United States is explained by the fact that the majority of these cases were brought into the service at the time of the draft, while an effort was begun toward the end of 1917 to keep men with venereal disease from service abroad. There was a steady decline in the reported venereal disease cases in the American Expeditionary Forces up to September 1918, but in subsequent months the rate seems to have increased.

Dysentery, diarrhea, and enterocolitis are best considered as a group because of the difficulties of differentiation, especially in the field. In the Civil War this group was reported to be the leading cause of illness (*14*). They were of less importance in the Army during 1917–19 than in preceding conflicts but were still of considerable moment, especially when it is remembered that many minor cases do not appear in the reported figures.

Measles was of serious consequence, as in the Civil War, not only because of its frequency but also because of the complicating pneumonia largely responsible for the 2,370 deaths ascribed to measles as the primary cause of admission. This disease is an extremely sensitive index of rapid expansion of the Army, with a characteristic flare-up in incidence upon the assembling in camps of large numbers of young men, many from rural areas and previously unexposed to the risk of infection. Mumps had a widespread occurrence and was of great moment in the American Expeditionary Forces. Its importance is particularly evident in the high total number of days lost from duty as a result of the numerous cases. The 17 days lost per case were comparable to those of 19 for measles and 18 for chickenpox, but the number of cases was much greater.

Diphtheria, scarlet fever, chickenpox, German measles, and poliomyelitis were not of relatively great effect upon the United States Army in 1917–19. They were of some note chiefly from the standpoint of noneffectiveness. Only scarlet fever ranked high among deaths from all causes. Infectious jaundice was reported responsible for 452 admissions and 15 deaths.

There were several diseases of which little or no previous mention had been made that commanded major interest in the period under discussion. Cerebrospinal meningitis was of relatively low incidence and was sporadic rather than epidemic in its occurrence in the Army, but its extremely high mortality made it of great importance as a cause of death in the United States forces. The case fatality varied in different camps from 9 to 63 percent and there were 1,836 deaths ascribed to this primary cause.

A relationship between the occurrence of influenza and of encephalitis lethargica has been noted. This type of encephalitis was recognized in 1917 in central Europe and appeared subsequently in other European countries and in the United States. The cases were not numerous but their spread was rapid and wide. The total occurrence in the Army is not known, but at least 20 cases, with 4 deaths, have been identified from clinical records.

Trench fever had apparently never been described as such prior to the war of 1914–18. It was responsible for 798 admissions and 2 deaths in the United States Army, with 786 of the admissions reported in the European forces. Vincent's disease, or trench mouth, was very rare in this Army before the arrival of the American troops in the European trenches. The total of 6,000 reported admissions among enlisted men in the United States and Europe is not representative of the extent of the occurrence of this comparatively mild affection.

There were 33,249 admissions for pulmonary tuberculosis in the entire Army, with 2,240 deaths. As an additional safeguard against tuberculosis, reexamination of the entire United States Army for this infection was begun in July 1917. Only some 40,000 men already sent abroad and some units leaving hurriedly at later times were not included in the reexamination. The signs of tuberculosis leading to rejection, including interpretation of X-ray findings, were carefully defined. The findings are summarized in the following table:

Reexaminations for pulmonary tuberculosis

	Number examined	Cases	
		Number	Per 1,000
Officers' training camps	53,905	195	3.6
Aviation service	38,835	62	1.6
Regular Army in the field	190,396	1,444	7.6
Coast Artillery Corps	40,396	297	7.4
National Guard	446,517	[1] 4,907	11.0
Troops of National Army (first draft)	361,314	2,435	6.7

[1] Estimated from number examined and rate quoted.

Up to March 1918 a total of 1,200,990 men had been reexamined and 9,648 recommended for discharge for pulmonary tuberculosis, a total

of 8 per 1,000. In the period of demobilization, from November 1918 up to June 30, 1919, there were 2,500,662 men examined of whom only 1,356, or 0.54 per 1,000, were found to be tuberculous.

Ayres (*2*) compares the annual number of deaths per 1,000 troops for the United States Army in the war of 1914–18 and in preceding conflicts to show a striking decline in the deaths from disease:

	Annual number of deaths per 1,000 troops	
	Disease	Battle
Mexican War, 1846–48	110	1[illegible]
Civil War (North), 1861–65	65	3[illegible]
Spanish War, 1898	26	[illegible]
War of 1914–18:		
Overseas (to Nov. 11, 1918)	19	5[illegible]
United States and France (to May 1, 1919)	15	1[illegible]

He ascribes the improvement in the death rate from disease to the services of a highly trained medical personnel, compulsory typhoid inoculation, improved sanitation, and provision of adequate hospital facilities.

United States Navy—war of 1914–18 (1).—The wartime increase in the size of the naval forces was accompanied by the widespread occurrence of mumps and measles. There were many cases of cerebrospinal meningitis, with high fatality, and tuberculosis and pneumonia were leading causes of death. Lobar and broncho-pneumonia were responsible for more deaths in the Navy than all the other communicable diseases combined. The Navy as a whole suffered little from typhoid fever, scarlet fever, and diphtheria. The comparatively low venereal disease rates early in the war were ascribed to the excitement and active duty, the appeal to patriotism, and enforced prohibition of alcohol for men in uniform. The absence of these factors after the signing of the armistice may at least partially explain the increase in the rate noted for 1919.

Admission rates in the entire Navy for certain infectious diseases for the active war years and for 1916 and 1919 were as follows:

	Admission rates per 1,000 strength			
	1916	1917	1918	1919
Cerebrospinal fever (meningococcus)	(1)	2.1	1.7	0.4
Diphtheria	0.7	.8	3.6	2.8
Measles	7.6	30.8	13.7	3.6
Mumps	10.6	39.8	35.4	19.7
Scarlet fever	1.3	2.7	2.4	2.4
Tuberculosis (all forms)	4.1	3.2	4.8	4.7
Typhoid fever	.2	.3	.2	.2
Venereal diseases	149.0	88.7	70.2	111.6

[1] Not given.

Because of the special conditions of ship life the Navy afloat constitutes a unit hardly comparable to the armies and civilians of countries at war. The fleet is largely protected by a quarantine period of observation from the introduction of infection by men drafted for duty. The barracks, depots, and training stations of the Navy are, however, more exposed to infection, for as in Army training camps the stream of new entries, the aggregation of susceptible material, and the contact with civilians invite epidemic invasion. During the war of 1914–18 the incidence of infectious diseases was generally greater among the men of the United States Navy ashore than among those afloat. This is illustrated by the following figures for influenza, bronchitis, and pneumonia in the year 1918:

	Number	Rate per 1,000		Number	Rate per 1,000
Total:			Bronchitis:		
Forces afloat [1]	50,219	162.0	Forces afloat [1]	4,520	14.6
Forces ashore	96,227	496.5	Forces ashore	9,216	47.5
Influenza:			Pneumonia (all forms):		
Forces afloat [1]	42,947	138.6	Forces afloat [1]	2,752	8.9
Forces ashore	77,457	399.6	Forces ashore	9,554	49.3

[1] Naval forces afloat and expeditionary forces (including marines) combined. The strength of the entire Navy for 1918 was 503,792; that of the forces afloat and expeditionary forces (including marines) combined was 309,974, and that of the forces ashore in the United States was 193,818.

INFECTIOUS DISEASE IN THE PRESENT WORLD WAR

Continental Europe—Present world war.—Up to the present, mild influenza and cerebrospinal meningitis have been the most notable infections occurring in warring nations, with typhus fever showing increased activity in eastern Europe. Cyclic increases in cerebrospinal meningitis have been observed at intervals of from 8 to 12 years. A general decline in incidence, beginning after the war of 1914–18, was succeeded by marked increases in 1928–29. The recession from this peak continued until about 1934. In 1936 the disease was at the maximum of a new upward curve in the United States and a rise was observed in Italy and Greece. This rise was evident in 1937 in Poland, Turkey, Rumania, and Yugoslavia, and in 1938 in Bulgaria, Germany, England, and Scotland. In 1939 and the early part of 1940 the occurrence of the disease was extremely widespread in the latter countries as well as in Austria-Hungary, Slovakia, Yugoslavia, and Switzerland. The number of cases reported seems generally to have been without precedent, at least in recent years.

In Germany the notifications of cerebrospinal meningitis numbered 1,826 (2.7 per 1,000 population) in 1938 and 5,046 (7.5 per 1,000) in 1939. Hungary had an annual average of 52 cases from 1921 to 1928, whereas in 1939 there were 395 cases reported. Yugoslavia had 731 cases in 1939 in comparison with the 85 to 155 cases per year

for the preceding 12 years. Bulgaria had less than 50 cases a year from 1934 through 1936, but in 1939 there were 669. The figures available through March 1940 show a progressive decline in the United States since 1936 and do not indicate increased prevalence in Belgium, the Netherlands, or the Scandinavian countries. The current outbreaks show a widespread dispersion of sporadic cases, comparatively small seasonal variation, and a decline in case fatality.

Number of reported cases of cerebrospinal meningitis (13c)

Country	First 8 weeks		Country	First 8 weeks	
	1939	1940		1939	1940
England and Wales	287	2,336	Switzerland	4	164
Scotland	96	542	Hungary	27	270
Germany [1]	786	1,052	Yugoslavia	147	525

[1] Excluding Austria and the Sudeten area.

There was an increase of generally mild influenza in England and Wales, Scotland, Ireland, Germany, Hungary, Denmark, and Switzerland as well as in the United States. The outbreak in the winter of 1939–40 was not of the magnitude of the influenza epidemics immediately preceding it, in 1937, 1933, 1929, and 1927. The recorded data showed no unusual occurrence in Finland, Norway, Sweden, or the Netherlands.

The incidence of typhus fever declined for the 10 years after 1921, but more recently there has been a recrudescence in Poland, Rumania, and Russia, the chief European foci of this disease. In 1938 there were 7,295 cases of typhus reported from Europe (excluding the U. S. S. R.), of which 2,748 cases were in eastern Poland and 1,603 in Bessarabia, a far-eastern district of Rumania that had been a part of Russia. During the winter of 1939–40 some increase in typhus in comparison with the previous year was observed in Bessarabia, southern Yugoslavia, and parts of Turkey, Bulgaria, and Hungary. Complete figures were not available for Russia, nor for Poland where typhus accompanied the refugee movements. The disease has also appeared in some sections of Germany where it has not been endemic, notably in East Prussia and in Polish Silesia. In March 1940, an outbreak occurred in Mecklenburg, a district of northern Germany bordering on the Baltic, with 23 reported cases and 6 deaths. No increases were observed in the first quarter of 1940 in Slovakia, Bohemia, Latvia, Estonia, or Finland.

Typhus fever cases reported in Europe, 1937–39 inclusive (13d)

Country	Number of cases			Country	Number of cases		
	1937	1938	1939		1937	1938	1939
Germany	0	0	0	Poland	3,501	3,566	[1] 3,140
Bulgaria	160	91	129	Portugal	67	37	32
Spain			[1] 67	Rumania	4,949	2,254	1,024
Finland	1			Czechoslovakia	82	33	[1] 3
France	1	1	([1])	Turkey	667	450	463
Greece	97	93	[1] 96	Russia:			
Hungary	22	5	57	R. S. F. S. R. in Europe	[1] 18,744		
Ireland	5		5	White Russia	[1] 3,338		
Latvia	3	5	4	Ukraine	[1] 345		
Lithuania	110	124	154	Yugoslavia	908	633	411
Netherlands	1						

[1] Incomplete.

An outbreak of dysentery comparable to that of the war of 1914–18 occurred in the German Army during the Polish campaign of 1939. Polish refugees in Rumania and Hungary are reported to have suffered from typhus fever, malaria, and respiratory diseases.

Comparison of the total reported cases of typhoid and paratyphoid fevers for 1938 and 1939 shows no sizable increase in any country for which data are available, with the single exception of Finland. Here the notifications rose from 699 in 1938 to 1,048 in 1939. Out of a total of 15 countries in the war zone, 7 showed some increase in 1939 while 8 reported fewer cases than in 1938, as did Australia, Japan, and the United States.

Cases of typhoid and paratyphoid fevers reported in certain countries in 1938 and 1939 (13e)

Country	Number of cases		Country	Number of cases	
	1938	1939		1938	1939
Sweden	440	508	Germany (excluding Austria and the Sudeten area)	6,152	5,449
Finland	699	1,048	Austria	1,624	1,877
Netherlands	410	458	Belgium	286	351
France	4,120	4,373	Italy	41,330	30,024
Bohemia and Moravia	[1] 1,607	[1] 1,159	Yugoslavia	5,612	4,568
Slovakia	[1] 2,124	[1] 1,400	Hungary	7,399	7,117
Bulgaria	2,911	2,418	United States	14,248	12,808
Rumania	6,505	4,468	Australia	347	224
Japan	48,204	43,125			
England	1,321	1,520			

[1] Incomplete.

England—Present world war.—After the war of 1914–18 England initiated and strengthened many public health measures, including maternal, child health, tuberculosis, and venereal disease programs, insurance medical service, and supervision of school children. At the end of 1938 the health record was good and improvement was indicated by the decline in mortality since 1919. The general death rate had dropped from 13.8 per 1,000 population to 11.6, the infant mortality rate from 89 per 1,000 live births to 53, the maternal mor-

tality rate from 4.4 per 1,000 live births to 3.1, the tuberculosis death rate from 126 per 100,000 to 60, and the typhoid death rate from 1.6 to 0.4 (*10f*).

The state of war existing since September 1939 might well be expected to result in an increased prevalence of infectious diseases. The mass migrations of large groups of the population were in particular viewed with pessimism. No such movement of the people of the British Isles had been known since the time of the Great Plague of 1665, when London was emptied of about two-thirds of its population. In the early fall of 1939 about 1,270,000 persons were moved, including 735,000 school children, 166,000 mothers and other adults with 260,000 young children, 12,000 expectant mothers, in addition to teachers and helpers and the blind or crippled. It was estimated that by the middle of the following January over 87 percent of the evacuees had returned home (*3c*).

On September 1, 1939, the evacuation of mothers and children began, from urban to rural areas and later from the south and east coasts to inland sections. The change in environment, with the intermediate massing in reception areas, the closing of schools and termination of school health activities, and the possible introduction of infection to previously unexposed groups provided excellent fuel for epidemics. It was thought that the migrants might readily introduce the common communicable diseases among the more susceptible rural children, while the infections carried by milk and water, especially typhoid and dysentery, would find fresh victims among the newcomers. The unpasteurized milk of the country, rare for city children, was a possible agent for the transmission of scarlet fever, diphtheria, undulant fever, and tuberculosis.

The health problem of the bomb shelters was intensified by the fact that many people slept in the close quarters originally provided only as temporary refuge during daylight raids. Although these shelters accommodate only a small proportion of the total population, large numbers of people are nevertheless involved. The opportunities for the transmission of disease were thus greatly enhanced (*3e*). Not only overcrowding but also lack of sanitation and sanitary supervision of heating and ventilation were thought to invite the spread of typhoid, dysentery, and the respiratory diseases.

Additional foci of tubercle infection resulted from the limitation in the hospitalization of the tuberculous to provide facilities for expected air-raid casualties. An unusually severe winter, with a shortage of fuel, and the black-out, both resulting in difficulties of ventilation, also encouraged the spread of respiratory infections. These particular factors augmented the health hazards of war resulting from mobilization, changes in dietary habits, nervous strain, lack of sleep, and increased fatigue, particularly among the industrial workers.

Reports of the incidence of infectious disease since the outbreak of the war have shown no such general increase as was feared, especially in the common communicable diseases of childhood. In the first 2 months of the sunny autumn during which most of the migration of school children took place, there was apparently less epidemic disease than in 2 corresponding months of peacetime in 1938. Improvement in the health of the child population was generally noted. Epidemics seemed to be controlled by the increased watchfulness, the closing of schools, and wide dispersal of children, rather than encouraged by the diffusion of carriers.

There were some localized outbreaks of diphtheria, scarlet fever, whooping cough, diarrhea, and dysentery, but the total incidence of infectious diseases was low, with the notified cases of diphtheria, poliomyelitis, and scarlet fever all lower than in 1938. Returns for the first 7 months of the war showed an almost complete absence of deaths from diphtheria, whooping cough, and measles. Whooping cough remained low both in prevalence and fatality. An expected biennial epidemic of measles did not materialize. Only chickenpox, and, to a greater extent, German measles, attained epidemic proportions. The freedom from childhood infections which characterized the early days of wartime in England was not continued, for the fall of 1940 brought increases in diphtheria, measles, scarlet fever, whooping cough, and poliomyelitis in comparison with the previous year, although in most cases these diseases were not as prevalent as in 1938.

In June 1940 there was a rise in the notifications of typhoid fever and by the end of July the reported cases were four times as numerous as in the corresponding week of 1939. No differentiation was made between typhoid and paratyphoid, but the mildness of the cases led to the conclusion that the latter predominated. Reports from local sources also indicated that outbreaks of paratyphoid have been fairly numerous and extensive.

The incidence of respiratory infections was somewhat higher than usual but there was a great drop in the number of pneumonia deaths, attributed at least in part to the use of the sulfanilamide compounds. Deaths from tuberculosis showed an increase.

Influenza and cerebrospinal fever were both extremely widespread. Influenza is not notifiable but some indication of its prevalence may be obtained from the number of deaths ascribed to this cause in the 126 great towns of England and Wales, which include over half of the total population, and from the cases of primary and influenzal pneumonia recorded for the entire country. The deaths from influenza reported for the 6 weeks ending March 2, 1940, were 416, 350, 514, 521, 629, and 512; these are higher than the average figures for this season of the year. In each of these 6 consecutive weeks over 2,000 cases of primary and influenzal pneumonia were recorded. The

numbers of influenza deaths and of pneumonia cases rose abruptly at the end of 1939 and continued high until the end of March. During the 17 weeks from early December through late March there were 4,685 deaths ascribed to influenza in the large towns, which may be compared with 3,009 in the corresponding weeks of 1938–39; 7,726 in 1936–37, and 10,660 in 1932–33 (*10i*). The normal age distribution, with old people particularly affected, suggested unusual prevalence but not severity.

Cerebrospinal fever in England and Wales (3d)

Year	Number reported		Year	Number reported	
	Cases	Deaths		Cases	Deaths
1913	305	232	1927	469	430
1914	315	396	1928	412	438
1915	2, 566	2, 203	1929	650	588
1916	1, 306	1, 368	1930	661	632
1917	1, 465	1, 651	1931	2, 152	1, 440
1918	798	926	1932	2, 087	1, 213
1919	848	694	1933	1, 668	942
1920	583	533	1934	1, 079	729
1921	411	416	1936	864	617
1922	344	360	1936	967	635
1923	300	284	1937	1, 112	698
1924	397	310	1938	1, 258	652
1925	402	354	1939	1, 508	----------
1926	384	365	1940 [1]	5, 093	----------

[1] From weekly returns of Registrar-General (corrected), first 13 weeks of year; the provisional figure for the year 1940 is about 12,500.

Previous notifications of cerebrospinal fever in England and Wales have never approached the 1939–40 figures. While the fatality rate was low, the cases were very numerous and scattered over the country during a long period after the rise in January. The epidemic continued into the summer and its course suggested the possibility of an even higher incidence this winter. In the first 10 weeks of the year, there were 3,558 cases reported, with a maximum in March, in comparison with 1,508 for all of 1939, 1,258 in 1938, and 3,500 in the 1915–16 epidemic. The case fatality varied greatly in different parts of the country but was on the whole much less than that of 1914–18, when the fatality was about 60 percent among civilians and sometimes reached as high as 80 percent; in the 1939–40 epidemic the average was closer to 10 or 12 percent.

In a review of Britain's mortality, by age, for the first 7 months of the war (September 1939–March 1940, inclusive) Stocks (*10h*) found that in the age group under 5 years there had been a fall in the death rate from pneumonia, bronchitis, diarrhea, and whooping cough. There were no material changes in the figures for children 5 through 14 years of age. Adults 15 through 44 showed an increased mortality during the winter period from heart disease, respiratory tuberculosis, and the respiratory diseases, with the exception of pneumonia, which

showed no marked increase. Among persons over 45 there was a great increase in mortality, particularly notable for heart disease, the respiratory affections, and traffic accidents.

According to an Associated Press dispatch for January 7, 1941, Sir William Jameson, chief medical officer of the Health Ministry, announced increases for England and Wales in the number of reported cases of cerebrospinal meningitis, pneumonia, typhoid fever, and dysentery for the year 1940. There were about 12,500 cases of cerebrospinal meningitis in 1940 as against 1,500 in 1939, but the fatality was low. Reported pneumonia cases were 42,000 in 1939 and 46,000 in 1940; typhoid fever, 1,500 in 1939 and 2,800 in 1940; and dysentery, 4,170 in 1938, falling to 963 in 1939 but reaching 2,500 in 1940. Diphtheria and scarlet fever showed a decline.

Up to the end of March 1940, the health of the Army had been good except for the epidemics of influenza, cerebrospinal fever, and German measles. The occurrence of cerebrospinal fever was sporadic and showed a fatality markedly lower than that of the war of 1914–18. In the first 6 months of the war a total of 371 cases had been reported in the troops at home and abroad. The general physical condition of the troops was considered to be better than in 1914–18 and it was felt that their food was better and that the use of the mobile baths should greatly lessen skin and parasitic infections. Although by February 1940 some treatment centers were reporting a material increase in the number of new cases of venereal disease, knowledge of treatment has greatly increased in the last few years and the prevalence in the defense forces was not considered comparable to that in the early stages of the last war when it has been estimated that about 400,000 men in the British Army of approximately 5,000,000 were infected.

The British feel that the prophylaxis against smallpox, tetanus, and typhoid fever, subject to the soldier's consent, should control the incidence of these diseases, while the new chemotherapy is expected to reduce the hazards of gonorrhea, cerebrospinal meningitis, and pneumonia.

Up to the present time respiratory infections are the objects of special concern in England, and colds, influenza, pulmonary tuberculosis, and cerebrospinal fever are particularly to be guarded against.

SUMMARY

The history of wars before the twentieth century is characterized by accounts of the great ravages of typhus fever, smallpox, typhoid fever, dysentery, malaria, cholera, and bubonic plague. In modern warfare, influenza and other respiratory affections, cerebrospinal meningitis, and venereal diseases are apparently of outstanding importance. While the historic pestilences remain lurking dangers, controlled chiefly by the unremitting application of the principles of

sanitation and immunology, it is unlikely that they will again be responsible for most of the mortality of wartime.

Infections invariably killed more soldiers than did bullets until, in the Franco-Prussian War of 1870, the German Army recorded an excess of deaths from battle. In the Russo-Japanese War of 1904 both sides maintained the higher proportion of deaths from wounds. In spite of the toll of influenza, the war of 1914–18 was the first in which United States fighting forces participated with fewer deaths from sickness than from battle, although for the entire Army, at home and abroad, the deaths from disease were preeminent.

During and after the war of 1914–18 the common war diseases were highly prevalent in eastern Europe and there was a vicious pestilence of typhus fever throughout Russia, Poland, and Serbia. Typhus did not spread in western Europe in these war years and the classic infections did not constitute the major sickness problems among fighting forces or civilians. The influenza pandemic overshadowed all others and the mortality from influenza and pneumonia recalled the ravages of the Black Death. Cerebrospinal meningitis reached new heights and tuberculosis and venereal disease increases caused grave concern.

In the United States Army influenza, venereal diseases, mumps, and measles were the most frequent causes of absence from duty and influenza, tuberculosis, measles, and cerebrospinal meningitis were leading primary causes of death. The Army in the United States had generally higher rates for admission and days lost from duty for the infectious diseases than did forces abroad. The United States Navy also suffered from the communicable diseases, with a notably higher incidence in the training camps than on shipboard.

In the present war, influenza and cerebrospinal meningitis are again showing increased incidence, both for the Continent and the British Isles. Typhus fever and dysentery have been active in eastern Europe.

The evacuation of school children did not result in the expected increase in the communicable diseases of childhood in England, and for the most part the health of the people has not been seriously affected. The hazards of infection have, however, been intensified by the crowding of the bomb shelters. Not only influenza and cerebrospinal meningitis but also paratyphoid fever and dysentery showed increases in 1940 in comparison with figures for 1939.

In the control of disease as in the fighting of battles the experience of the past can provide no rigid rules for present victory. Nevertheless an appreciation of former problems may facilitate their solution in later experience. The changed character of the leading infectious diseases of war, with relegation to the background of the scourges of

the past, may be considered a heartening reflection of the results of scientific research and control.

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See also: Index Medicus. War Supplement. A classified record on military medicine and surgery, 1914–1917. The Carnegie Institution of Washington, Washington, D. C.

CARBON DISULFIDE: ITS TOXICITY AND POTENTIAL DANGERS

Prepared by the DIVISION OF INDUSTRIAL HYGIENE, *National Institute of Health, United States Public Health Service*

Carbon disulfide is a toxic material which in high concentrations acts as a narcotic, whereas in low concentrations and with prolonged exposure it is a severe nerve poison.

Physical-Chemical Properties of Carbon Disulfide.

Pure carbon disulfide, CS_2, is a colorless liquid of a molecular weight of 76.13 and a specific gravity of 1.263 at $\frac{20^\circ}{4^\circ}$ C., if liquid, and of 2.63 against air. It has an unpleasant characteristic odor, melts at −111.6° C. and boils at 46.3° C. Its vapor pressure is 298 mm. at 20° C. and 433 mm. at 30° C. It is soluble in 100 parts of water to the extent of 0.14 parts at 49° C. and mixes freely with alcohol and ether. It is a good solvent for rubber, fats, and oils. It turns yellow upon standing under the influence of light. Its flash point is −25.5° to −20° C. and it has an extremely low ignition temperature of 120 to 156° C.; an air mixture containing 1.5 percent carbon disulfide flashes at 108° C. and even contact with moderately hot objects, such as steam pipes and electric bulbs, may cause ignition of the vapors. The lower explosive concentration limit is given as 1.06 volumes percent and the upper explosive concentration limit has been determined as 50 volumes percent at 6° C.

Maximal Permissible Concentration of Carbon Disulfide.

The maximal permissible concentration of carbon disulfide is at present accepted as 20 parts per million parts of air by volume,[1] corresponding to 0.062 milligrams per liter at 25° C. and 760 mm. Hg, for exposures not exceeding a total of 8 hours daily.

Sources of Exposure to Carbon Disulfide.

Exposure to carbon disulfide may exist in a number of industries.

In the *rayon industry* carbon disulfide vapors are developed, especially in the preparation of viscose and in the spinning and washing operations.

In the *rubber industry* the same hazard exists when carbon disulfide is used as a solvent for sulfur in cold vulcanization or as one of the solvents for rubber cement.

In the *fumigation industry* it is used as an insecticide.

In the *chemical industry* it is used as a solvent for fat, oils, and phosphorus. It is also used in the manufacture of carbon tetra-

[1] This figure for the maximal permissible concentration of carbon disulfide has been accepted and published by the American Standards Association in its Standard on Allowable Concentrations of Toxic Dusts and Gases—Z37.3-1941. Copies of this standard may be purchased from the American Standards Association, 29 West Thirty-ninth Street, New York, N. Y.

chloride, camphor, and, to a certain extent, in the manufacture of many products, such as waterproof cements.

Determination of Carbon Disulfide in Air.

For the determination of carbon disulfide in air, samples should be taken wherever there is a known or suspected source of carbon disulfide. They should be taken at the breathing level of the workers exposed, special emphasis being given to the locations nearest the source and those in the path of air currents carrying the gas. Samples should be taken in sufficient numbers and at sufficient intervals of time to allow the determination of the average and maximal exposures.

There are several methods for the determination of carbon disulfide in air. Some are based on the formation of ethyl xanthate in an alcoholic solution of potassium hydroxide. In these determinations a sufficient amount of air (at least 15 to 25 liters) is drawn through a solution of potassium hydroxide in absolute alcohol at a rate of 0.6 to 1.5 liters per minute after hydrogen sulfide and ammonia have been removed by lavage with cadmium chloride and with diluted sulfuric acid. The potassium ethyl xanthate formed in this way may be determined directly by iodometric methods as described by Matuszak (1932) (*1*) or by precipitation with copper sulfate and subsequent determination of the copper in the washed precipitate as used by Barthelemy (1939) (*2*) and by Frauenhof (1935) (*3*).

More recently the interaction of carbon disulfide with diethylamine and cupric acetate, resulting in the formation of cupric diethyldithiocarbamate, has been used for its determination in air by Viles (1940) (*4*) and has been suggested by the British Department of Scientific and Industrial Research (1939) (*5*). In the first procedure a certain volume of air is bubbled through a mixture of an alcoholic triethanolamine solution of diethylamine and cupric acetate and the carbon disulfide is determined by matching the yellow color, produced in this reagent by carbon disulfide, against standards prepared by the same procedure from alcoholic solutions of carbon disulfide of known concentrations. It appears that for this determination 160 to 360 cc. of air are sufficient and that it gives satisfactory results in a range of 10 to 80 parts per million. Data found with this method indicate that the method of sampling may have some effect on the results but that the analytical error is not more than about ± 1 percent for low concentrations, whereas with higher concentrations (80 parts per million) it may be distinctly greater.

Concentrations of Carbon Disulfide Determined under Various Conditions.

The concentrations found in various operations in which more or less severe toxic reactions have been observed range from 32 to 602 parts per million according to Constensoux and Heim (1910) (*6*),

Kranenburg and Kessener (1925) (*7*), Weise (1933) (*8*), Althoff (1905) (*9*), and Voltmer and Nuck (1933) (*10*).

Absorption and Excretion of Carbon Disulfide.

The absorption of carbon disulfide takes place mainly through the lungs. Sufficient quantities to cause toxic effects may be absorbed through the skin and, if taken orally, also from the gastro-intestinal tract. The excretion takes place mainly through the lungs but a small fraction seems to be excreted with the urine, the sweat, and the feces.

Determination of Carbon Disulfide in Blood and Urine.

For the determination of carbon disulfide in blood the same principles may be utilized as used for its determination in air. A micro method, based on the formation and titrimetric determination of potassium xanthogenate, was worked out by Harrower and Wiley (1937) (*11*) but this is tedious and time-consuming. Hunter (1940) (*12*) determined carbon disulfide in blood and urine by extracting these twice with sulfur-free petroleum ether and determining the CS_2 in these extracts with diethylamine and cupric acetate. The yellow color of cupric diethyldithiocarbamate is matched against standards prepared in the same way from alcoholic solutions of carbon disulfide of known concentrations.

Relation Between Concentrations of Carbon Disulfide in Air and Toxic Symptoms.

The effects of high concentrations of CS_2 in air are illustrated in table 1.

TABLE 1.—*Toxicity of carbon disulfide for man (according to Lehmann-Hess)*

[Flury and Zernik, 1931 (*14*)]

Symptoms	Concentrations	
	Milligrams per liter	Approximate parts per million by volume
Immediately fatal, or later with exposure to ½ to 1 hour	15	4,800
Dangerous to life in ½ to 1 hour (Hess)	10-12	3,200-3,850
Tolerated for ½ to 1 hour without immediate or late effects	3-5	960-1,600
Already effective with exposure for several hours (Hess)	1-1.2	320-390

Continued exposure to much lower concentrations will cause serious disturbances, as indicated by more recent observations in which toxic signs and symptoms observed in workers were correlated with concentrations of carbon disulfide as determined in such operations. Such data (*6, 7, 8, 9, 10*) indicate that concentrations of 30 to 40 parts per million of air may cause distinct subjective and objective disturbances with sufficient lengths of exposure.

Clinical Picture of Carbon Disulfide Poisoning.

Inhalation of high concentrations of carbon disulfide resulting in *acute poisoning* causes unconsciousness which may be preceded or followed by delirium and may end in death from respiratory failure. Less severe exposure may result in headache, giddiness, respiratory disturbances, precordial distress and gastro-intestinal disturbances. *Chronic carbon disulfide poisoning* is much more common than acute intoxications. It is characterized by a toxic effect on all nervous structures and also on the blood and other organs, and there may be transitory changes from the acute to the chronic form. Incipient chronic carbon disulfide poisoning is usually first characterized by subjective complaints such as fatigue, loss of memory, heaviness of the limbs and vertigo, which symptoms may rapidly disappear in fresh air. If the exposure, however, is continued or repeated, these symptoms may persist. In addition, there may be insomnia during the night and sleepiness during the day, weakness, loss of appetite, gastro-intestinal disturbances characterized by constipation or diarrhea, gastric pain, loss of weight, bad taste in the mouth, frequent urination, menstrual disturbances, primary increase and secondary decrease of libido. There may also be fainting spells, visual disturbances, staggering gait, various nervous disturbances such as reduction of corneal and palpebral reflexes, anesthesias and paresthesias, circumscribed paralysis resulting in atrophy of the corresponding muscle groups, tremors, and damage of the optic and acoustic nerves. Psychoses may develop, of manic or depressive character, and they may be of various intensities, but as a rule these are of transitory nature although permanent psychoses have been reported. In more severe chronic carbon disulfide poisoning, symptoms similar to Parkinsonism and multiple sclerosis have been reported, indicating the toxic effect on the corpus striatum, the globus pallidus, and the globus niger. The differentiation between these different conditions may offer considerable difficulties. The visual disturbances may vary considerably in intensity and character. In light cases they may be so moderate that they escape attention. Some patients complain of foggy vision. Others may suffer from color scotoma, reduction of the visual field, and, occasionally, from central scotoma. Most of these disturbances appear to be due to an affection of the optic nerve, the papilla, or the retina. Affections of the exterior muscles of the eyeball are exceptional.

The respiratory tract may show various degrees of irritation; there may be congestion of the lungs with bloody sputum, emphysema, and also chronic bronchitis.

The subjective signs from the gastro-intestinal tract mentioned above may become more severe with continued exposure and may develop into chronic gastritis and favor the formation of gastric and

duodenal ulcers. Spasms and dysfunction of the bladder have also been observed.

There is no evidence that carbon disulfide has a definite effect on the *circulatory apparatus* although palpitation of the heart, irregularities of the pulse, and bradycardia and tachycardia have been reported.

There is some evidence that continued exposure to carbon disulfide may affect the blood and possibly also the blood-forming organs, resulting in anemia characterized by reduction of the red blood cells and the hemoglobin, whereas the white blood cells may vary in their response. These occur, however, after nervous symptoms have developed.

Contact of carbon disulfide with the *skin* causes irritation and if maintained for a sufficient length of time it may result in severe pain, hyperemia, erythema, and blister formation which may have the tendency to form recidives, as demonstrated by Hueper (1936) (*15*) and by Oettel (1936) (*16*).

Table 2 gives information regarding symptoms observed in a group of 57 persons exposed to comparatively low concentrations of carbon disulfide (30 parts per million and more) as published by Voltmer and Nuck (1933) (*10*). This table appears to be especially instructive because it indicates which signs and symptoms should be looked for in periodical physical examinations of workers.

TABLE 2.—*Percentage incidence of toxic manifestations in a group of 57 persons exposed to moderate concentrations of carbon disulfide*

[Voltmer and Nuck, 1933 (*10*)]

	Percent		Percent
Subjectively and objectively normal	10.5	Nausea and vomiting and headache	38.6
Loss of appetite, gastro-intestinal disturbances, headache, loss of libido, excitement, depression	12.3	Forgetfulness and loss of memory	24.6
Polyuria	7	Slight visual disturbances	66.6
Loss of appetite	19.3	Sensory disturbances in different locations of the body	17.6
Intestinal irregularities (especially constipation)	33.3	Fatigue	[1] 100

[1] Practically.

Pathological Changes Observed in Carbon Disulfide Poisoning.

Pathological changes observed in acute carbon disulfide poisoning are characterized by hyperemia of the brain and other organs and multiple hemorrhages. In chronic forms with symptoms similar to Parkinson's disease, regressive changes and fatty degeneration of the liver, kidneys, and heart and, in addition, changes of the nervous system have been reported. The latter were more severe in the gray matter of the brain and in the pons where the pyramidal tracts showed severe degeneration. The corpus striatum and, to a lesser extent,

the globus pallidus, may show degenerative changes of the nerve cells and bundles with simultaneous proliferation of the neuroglial tissue (*18*). In cases of peripheral neuritis, the affected nerves and the muscles supplied by them may show various degrees of degeneration. Degenerative changes of the adrenals and of the pituitary have also been reported. The lungs may show emphysema and atelectases. The blood picture may show a reduction of the red blood cells with anisocytosis and poikilocytosis. As pointed out above, changes of the white cell picture are not constant. Some observers reported a monocytosis and eosinophilia (*19*).

Changes of Tolerance for Exposure to Carbon Disulfide.

As with other poisons, there appear to be considerable variations regarding the susceptibility to carbon disulfide, but it appears that there is no increase of the resistance against the toxic action; on the contrary, the poisoning may cause high susceptibility for further exposure.

Mechanism of Carbon Disulfide Poisoning.

Regarding the mechanism of carbon disulfide poisoning, it appears that carbon disulfide acts directly as a nerve poison and the question of whether or not it acts by some other mechanism has not been determined.

Prevention of Carbon Disulfide Poisoning.

In the prevention of carbon disulfide poisoning, proper instruction regarding its dangers of those who handle the material is very important.

Wherever possible, carbon disulfide should be handled in closed systems; if drained, it should be collected under water and it should be stored under water or under some inert gas which will not react chemically with carbon disulfide. Waste water containing carbon disulfide should not be drained into the sewer system.

When carbon disulfide is used as a solvent, the room should have adequate forced ventilation, the vapors should be removed at the site of their formation by proper exhaust ventilation and in order to prevent explosion this should be arranged in such a way that vapors do not come in contact with hot pipes, hot plates, or hot electric light bulbs. In operations where carbon disulfide is handled, the electric lights should be covered with vapor-proof globes, and any electrical or other devices which may produce sparks should be protected in such a way that any contact with carbon disulfide vapors is rendered impossible.

Regarding the allowable limits for the pollution of air with carbon disulfide, it is definitely known that continued exposure to 30 parts

per million is liable to cause toxic effects. Twenty parts per million has been accepted as the maximal permissible limit for continued exposure.

When rooms or enclosures containing carbon disulfide vapors have to be entered, air-supplied masks and safety belts should be worn. During the whole time, the workers should be watched by a supervisor familiar with the toxicity and potential dangers of carbon disulfide and with the first-aid treatment of accidents.

In order to prevent carbon disulfide poisoning, greatest personal hygiene is of paramount importance; any contact with the skin should be avoided. It should be emphasized that rubber gloves offer no adequate protection because carbon disulfide penetrates them readily and they interfere subsequently with the rapid evaporation from the skin. Serious injury of the subcutaneous tissue and the peripheral nerve endings may result from their use. Any soiled garments should be removed at once and any spills on the floor or tables should be removed and the rags used for this purpose should be discarded at once.

Workers exposed to carbon disulfide should have periodic examinations with special attention to subjective complaints. A thorough examination of the nervous system, including the examination of the eyeground, is essential. In order to prevent possible cumulative effects of carbon disulfide, periodic rotation to operations in fresh air of the workers exposed to this toxic agent appears advisable.

The treatment of carbon disulfide poisoning should consist in the first line in discontinuation of the exposure. In *acute poisoning* the patient should be transferred to fresh air and any soiled garments should be removed at once and, if necessary, the skin should be washed with large quantities of alcohol to remove the toxic material. The patient should be placed under the care of a physician as soon as possible. If the patient is in collapse, any chilling should be avoided by wrapping him in warm blankets and keeping him warm with hot water bottles with the necessary precautions to avoid direct contact with the skin. The application of analeptics such as caffeine sodium benzoate may become necessary. If the respiration is slow, irregular, or intermittent, administration of oxygen, alone or in combination with carbon dioxide, may become necessary. If the respiration has stopped but the heart is still beating, artificial respiration with the Shaefer prone pressure method should be instituted. Artificial respiration should be given only when indicated and then with proper precautions on account of the possibility of existing pulmonary hyperemia and emphysema.

In *chronic poisoning*, removal from further exposure is essential. Proper and adequate nutrition, fresh air, and other measures to improve

the physical condition are of great benefit and may be sufficient to overcome minor injuries. Severe cases of poisoning require symptomatic treatment.

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EXPERIMENTAL POLIOMYELITIS [1]

The Use of a Variety of Laboratory Techniques in Efforts to Establish Seven Strains of Poliomyelitis Virus in the Cotton Rat

By S. D. Kramer, M. D., and W. N. Mack, with the assistance of A. T. Himes

In view of the importance to poliomyelitis research of Armstrong's successful transmission of one strain of poliomyelitis virus to the eastern cotton rat and white mouse (*1*, *2*), we undertook a study to

[1] From the Bureau of Laboratories of the Michigan Department of Health, Lansing, Mich. Aided by a grant from the National Foundation for Infantile Paralysis, Inc.

determine the regularity with which other strains of the virus might be established in these animals. The procedures employed in these attempts are listed and described below.

Seven strains of virus and a total of 257 eastern cotton rats were used in this investigation. Of these seven strains one was our own V. M. old monkey laboratory strain and the remaining six were recently isolated strains, three in our own laboratory from the feces of contacts and three isolated by Dr. John Kessel from post-mortem material. In addition, one series of rats was inoculated with infective fecal material.[3] (See table 1.)

That infection of the cotton rat is not readily accomplished by the usual laboratory procedures is evidenced from Armstrong's long efforts, from Toomey's first negative experience with nine strains of virus (*6*) in which 68 rats were used, from Hammon's similarly negative results (*7*), and from our own failure to establish any strain successfully in these animals. In spite of our failure we have, in the course of our investigations, encountered a number of suggestive symptoms and histologic changes in rats which encouraged us to continue these investigations and prompted us to report these negative findings.

In two recent reports (*8*, *9*) of the successful transmission of monkey poliomyelitis to cotton rats and white mice, the authors emphasized certain technical procedures which they employed and believed instrumental in obtaining positive results. In our own efforts we included most of the technical procedures that have in our experience or that of others proved useful in connection with poliomyelitis and other viruses. These are (1) the method of rapid passage, (2) mechanical trauma and trauma by starch, (3) reinforcing reinoculations, (4) use of the "spreading factor of Duran-Reynals," (5) hyperpyrexia, (6) chilling, and (7) the use of young, immature animals.

STRAINS

Table 1 lists the strains of virus employed, their source, and the number of animals inoculated with each. As can be seen from the table, strain D. G. received the most attention. This strain had given a rapid, prostrating paralysis in its first monkey passage.

[3] This stool was proved positive by successful monkey inoculation and illustrates the survival of the virus in the feces for over 6 months at ice-box temperature (*4*). It was concentrated by the usual procedure (*5*).

TABLE 1.—*Strains of virus employed*

Strain	Source of strain	Monkey passages	Number of rats which received				Total rats
			Fresh monkey cord	Glycerated monkey cord	Fecal material	Rat material	
D. G.	Feces	5, 6, 7, 8, 9	3	41		137	181
B. M.	Feces	4		2		4	6
S. M.	Feces	1, 2	6	10		5	21
S. M. (feces) [1]					4	13	17
Stock	Old monkey passage			1		3	4
Kessel Mc	C. N. S.	2		2			2
Kessel K	C. N. S.	2		2		20	22
Kessel Sch	C. N. S.	5, 6	2	2			4
Total			11	60	4	182	257

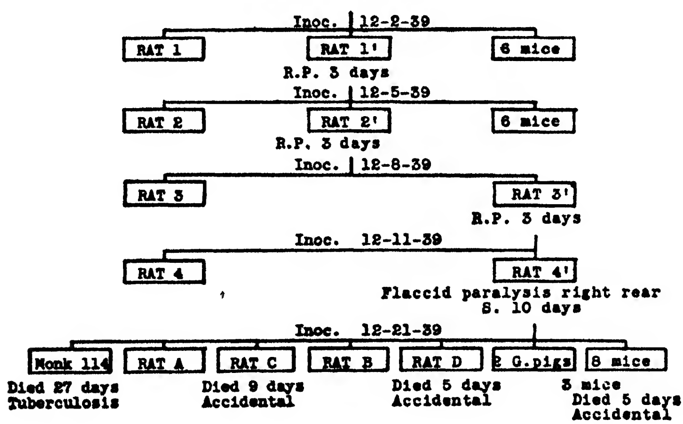
[1] See footnote 2.

TECHNIQUES EMPLOYED

1. Our method for rapid passage is illustrated in charts I and II. Two or more animals were inoculated, one or more of which were

CHART I

POOLED D.G. MONKEY CORDS*



* Monkey cords pooled: 22,28,61,67,102

sacrificed after 72 hours and passage made to a second series of two or more animals, one or more of which were sacrificed after 72 hours. This was repeated until a fourth passage was made. This procedure made it possible for us to observe both the parallel animals not sacrificed and the effect of rapid passage. In this, as in every other special procedure, whenever a surviving animal presented suggestive symptoms, it was sacrificed and 10 percent suspensions of the cord and brain were promptly inoculated into other rats.

2. Following the method successfully used by Sawyer in establishing the yellow fever virus in mice (*10*) we inoculated the rats with 0.06 to

0.2 cc. of a 2 percent soluble starch solution into one hemisphere and 5 to 20 minutes later we inoculated the 10 percent virus suspension in the opposite hemisphere. From time to time in the course of our inoculations we produced intentional cortical trauma by rotating the needle after insertion into the brain substance.

3. Following Flexner's suggestion (*11*) that subinfective doses could be made infective by periodic reinoculations, we reinoculated a large number of rats (see chart II) at weekly intervals for 1 or 2 successive weeks. In two instances animals were reinoculated with the concentrated S. M. fecal material.

4. The "spreading factor principle of Duran-Reynals" (*12*) was used in a small group of four animals. A 10 percent orchitic extract in saline prepared from untraumatized testes of a normal rabbit was used as diluent in preparing the 10 percent virus suspension.

5. Four animals were exposed to the radiations of a G. E. inductotherm short wave machine for 10 to 18 minutes until the animals' temperatures were elevated to from 105° to 109.4° F. These animals were immediately inoculated with the virus suspensions.

6. Seven rats, four of which had received preliminary chilling in the ice chest (3°–4° C.) for 24 hours, were inoculated and then kept at ice-box temperature. Two animals survived 52 days under these conditions. A number of the animals died in 3 days; two animals became ill with indefinite symptoms, were sacrificed, and passage was made into normal rats.

7. Six immature animals ranging in age from 1 to 3 weeks were inoculated with 10 percent virus suspensions.

Table 2 indicates the number of animals used for each special procedure and strain.

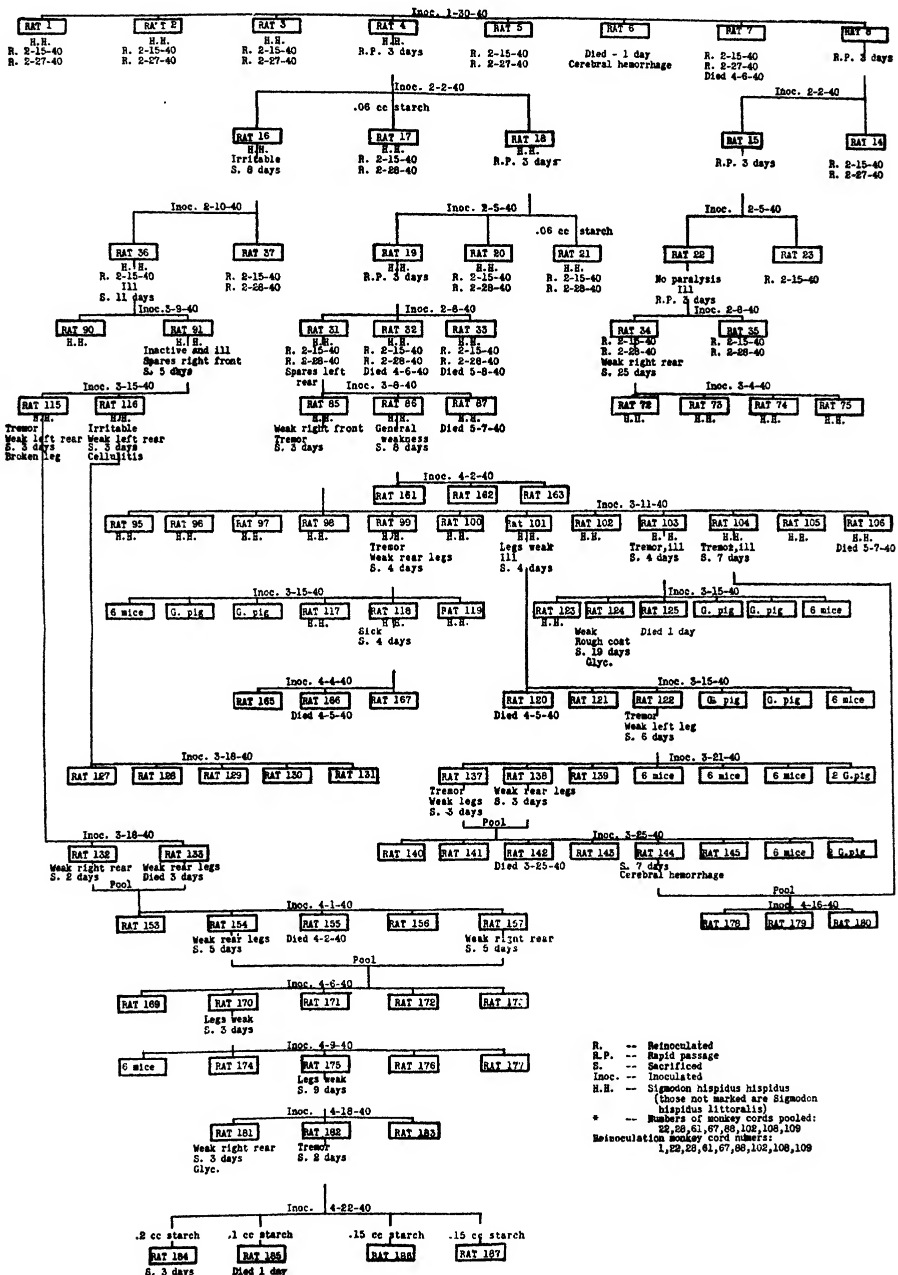
TABLE 2.—*Number of animals used*

Strain	Rapid passage	Preliminary starch inoculation	Reinoculations		Orchitic extract	Hyperpyrexia	Chilling	Immature animals	Total rats
			Number of rats	Number of reinoculations					
D. G.	29	7	47	89	4	4	3	6	100
B. M.	6								6
S. M.							4		4
S. M. (feces)			2	2					2
Stock	2								2
Total	37	7	49		4	4	7	6	114

The remainder of the 257 rats were inoculated following Armstrong's procedures or were used for passage of material from suspicious animals. In addition, 187 Swiss strain mice, 12 guinea pigs, and 3 monkeys were inoculated in the various experiments.

CHART II

POOLED MONKEY CORDS D.O. STRAIN*



In every instance when an animal was sacrificed for passage, fragments were taken from the central nervous system axis and occasionally from other systems and preserved in formalin or other preservative for histologic study.

The methods of inoculation were essentially those outlined by Armstrong. From 0.1 to 0.3 cc. of a 10 percent suspension of monkey or rat material was inoculated intracerebrally. The animals appeared to stand these larger amounts quite well. In addition to the intracerebral inoculations most of the animals received supplementary inoculations intraperitoneally (0.5-1.0 cc.), subcutaneously (0.2-0.5 cc.), or intranasally (0.03 cc.). For the intranasal instillations the sediment from the centrifuged virus suspension was resuspended in a little saline. At the outset of this investigation the entire rat brain and cord were ground to make the 10 percent suspension and used as inoculum. After some experience with the Armstrong strain where we found that essentially all of the virus was located in the cord and medulla, this portion of the cerebrospinal axis alone was used in the preparation of suspensions.

RESULTS

We were unsuccessful in establishing any of the seven strains of virus in the eastern cotton rat and the white mouse. At the very outset and on a number of later occasions we had reason to believe that our efforts would be fruitful, and it is largely on the basis of these suggestive leads that we are led to report our negative results. Rat 4′ (chart 1), the fourth animal in one of the rapid passage series, developed a flaccid paralysis of the right rear extremity 10 days after inoculation. This animal was sacrificed, brain and cord emulsified, and a 10 percent suspension inoculated into four rats. (Shortage of animals at this time limited us to this number.) Two of the four rats were accidentally killed. The surviving two rats remained symptom-free. Monkey 114 inoculated intracerebrally and intraperitoneally with material from this animal failed to present symptoms and died of tuberculosis on the twenty-seventh day after inoculation. Rat 4′ was the only animal in all of our attempts that developed a frank flaccid paralysis; nevertheless, the paralysis was typical, and no other cause could be found. Histologic examination of two levels of the cord showed it to be edemic. The motor cells were irregular in size and shape and exhibited degenerative changes ranging from the loss of nuclear material to almost complete degeneration. Inflammatory reaction was only slight and only occasional polymorphonuclear cells were observed. No instance of spontaneous paralysis has been seen in almost 1,000 rats which we have observed during the past 14 months.

From time to time in the course of the investigation other animals appeared to favor one or more extremities and these were promptly sacrificed and material passed on to other rats. However, none of the subsequently injected animals, even when the rapid passage or other procedures were employed, developed typical paralysis.

In one group of rats beginning with the fourth animal of a rapid passage series (rat 31) and which had also received two fortifying inoculations a peculiar syndrome was observed (see chart II). This animal developed some weakness of the left rear leg 8 days after the last reinoculation. It was sacrificed and 10 percent brain and cord suspension inoculated into three rats, one of which, on the third day, developed a tremor and a weakness of the right front leg. This animal was sacrificed and the brain and cord inoculated into 12 rats, four of which developed a tremor, general weakness, and spared one or more extremities 3 days following inoculation. Nearly all of the remaining eight rats presented similar symptoms to a varying degree from which they recovered after a few days. The four animals with symptoms were sacrificed and material from each of them was inoculated into three rats. As indicated in the chart these symptoms continued for four passages but none of the animals developed flaccid paralysis characteristic of the Armstrong strain or similar to that obtained in our own first rapid passage series (rat 4′). Histologic examination of sections of the cords of animals sacrificed in this series (rats 31, 85, 86, 101, 103, 104, 118, 120, 122, 124, 137, 138, 144) (see chart II) has presented suggestive changes. The outstanding features have been edema, congestion, diffuse microscopic hemorrhages, and changes in the anterior horn cells from poor staining quality and smudging to loss of nuclear substance, pyknosis, and disappearance. Infiltration has not been a prominent part of the histologic picture. However, in our experience, extensive infiltration has not been an outstanding feature in the cord sections of rats succumbing to the Armstrong strain.

DISCUSSION

Jungeblut (*8*), in a recent description of a murine strain which he believes is a successful infection of the cotton rat with the poliomyelitis virus, emphasizes the possible importance of rapid passage, particularly of animals presenting symptoms or dying following inoculation. Although this procedure was repeatedly employed and on at least one occasion did appear to result in successful infection, it would seem that this method cannot be uniformly employed with success. In this study we did not employ enteric toxin as diluent, as recommended by Toomey (*9*) in his recent report of successful infection of the cotton rat and white mouse. In our experience as well as in the more recent

experience reported by Hammon (7) the "spreading factor of Duran-Reynals" proved ineffective.

After what is now a rather extensive experience with the Armstrong strain of poliomyelitis in rats and mice, we are convinced that this strain of virus is indistinguishable from monkey poliomyelitis produced with other strains in that animal. And, although we have been unable to find any single technical procedure which will readily yield successful infection in rats, the single instance of frank, flaccid paralysis and the number of instances of what appeared to be partial paralysis offer sufficient encouragement for the continuation of these investigations.

ACKNOWLEDGMENT

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THREE NEW SPECIES OF *ORNITHODOROS* (ACARINA: IXODOIDEA)[1]

By R. A. Cooley, *Entomologist*, and Glen M. Kohls, *Assistant Entomologist, United States Public Health Service*

A new *Ornithodoros* found on a white-footed mouse and two new ticks of the same genus found on bats and in bat-inhabited caves and mines are here described. The species from *Peromyscus* was collected in southeastern Utah by field workers of the United States Public Health Service Plague Laboratory at San Francisco. The two species from bats were found in California and Arizona and additional specimens of one of them were obtained in Texas and Oklahoma.

[1] From the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

Ornithodoros eremicus n. sp.

Body.—(Nymph.) Short oval (approaching circular), broadly rounded on both ends; tips of the mouth parts visible from above. Length 1.44 mm.; width 1.11 mm.

Mammillae.—Numerous, small, and of about equal size in median and peripheral areas on both dorsal and ventral surfaces. Individual mammillae only a little elevated, flattened, with their surfaces smooth and shining. A few short hairs present on the dorsum; those on the anterior margin and above the anterior legs are longer.

Discs.—Little in evidence, small, and slightly depressed; absent on the venter.

Legs.—Moderate in length and size. Surface smooth. Hairs few in number. Subapical dorsal protuberances present on tarsi I, II, and III, absent on tarsus IV. Dorsal humps moderate; three on

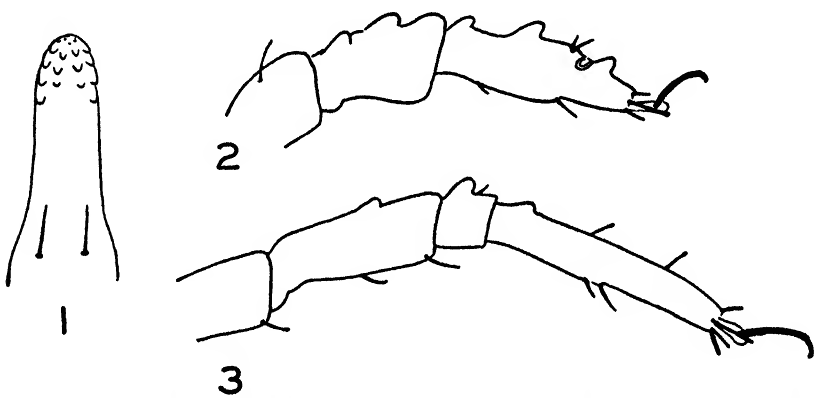

FIGURE 1.—*Ornithodoros eremicus* n. sp. 1. Hypostome of nymph. 2 Tarsus and metatarsus of leg I of nymph. 3. Tarsus and metatarsus of leg IV of nymph.

tarsus I, two on II, two on III, none on IV. Metatarsi I, II, and III each with three dorsal humps; metatarsus IV, with two. Length of tarsus I, 0.3 mm.; metatarsus, 0.18 mm. Length of tarsus IV, 0.42 mm.; metatarsus, 0.285 mm.

Coxae.—All coxae contiguous.

Hood, camerostome, and movable cheeks.—Absent.

Hypostome.—Moderate in length, sides parallel, apex rounded. Denticles arranged 2/2 with 2 or 3 teeth in each file, placed near the distal end. Length about 0.12 mm. (Description and drawing made with the hypostome *in situ*, not mounted.)

Folds.—Coxal and supracoxal folds present.

Grooves.—Dorso-ventral and preanal grooves present. Median postanal and transverse postanal grooves absent.

Eyes.—Absent.

Anus.—In a nearly circular frame.

This tick is described from a single small nymph received from Surgeon L. B. Byington, officer in charge, San Francisco Plague Laboratory. It is notable that, although the specimen is so small, dorsal humps on the tarsi are well developed. Since in all known American species the dorsal humps are poorly developed in the early nymphal stages and become progressively larger in the successive stages, it appears likely either that the adult would be very small, or, if of average size, the humps would be unusually prominent.

This new tick resembles the African species *O. savignyi* (Audouin).

Holotype.—A. P. 16314 from *Peromyscus maniculatus*, August 24, 1939, near Bluff, San Juan County, Utah, deposited in the collection of the Rocky Mountain Laboratory.

Ornithodoros stageri n. sp.

Body.—Oval, wider behind, and faintly pointed in front; somewhat flattened but with no change in structural pattern of the mammillae at the margins; tips of the palpi visible from above. Size of the holotype female 4.5 mm.×2.64 mm.; allotype male 3.84 mm×2.40 mm. Smallest and largest specimens, females, 3.3 mm.×2.4 mm. to 5.3 mm.×3.4 mm.; males, 3.3 mm.×2.3 mm. to 4.10 mm.×2.75 mm.

Mammillae.—Relatively large, few in number, and not crowded as in some species; irregular in shape, their tops smooth, convex, often with radial ridges on their bases. A few have a single, faint pit on the top which may or may not have a short, fine hair.

Discs.—Distinct, large, mostly circular; in depressed areas, but with elevated margins; present also on the venter where they are in lineal arrangement in or near the preanal, transverse postanal, and median postanal grooves.

Legs.—Moderate in length and size, with the surface smooth or very finely granulated, with barbed hairs moderate in number and in length. Dorsal humps and subapical protuberances absent. Length of female tarsus I, 0.66 mm., metatarsus 0.48 mm.; tarsus IV, 0.84 mm., metatarsus 0.75 mm. Length of male tarsus I, 0.45 mm., metatarsus 0.3 mm.; tarsus IV, 0.63 mm., metatarsus 0.54 mm.

Coxae.—Coxae I and II a little separated; all others contiguous.

Hood.—Negligible or absent.

Camerostome.—Faintly indicated.

Movable cheeks.—Present in the female; small, and somewhat variable in shape. Usually oval and attached at one side of the broad end. Absent in the male.

Capitulum.—Basis about as wide as long; surface irregular with transverse wrinkles. With two or three barbed hairs on each side on the lateral walls and a pair of spines back of the posthypostomal hairs,

which are more separated and smaller. Palpal article 1 with a thin flange projecting over the base of the hypostome.

Hypostome.—In both sexes the hypostome measures about 0.22 mm. and is notched, but there are structural differences in the

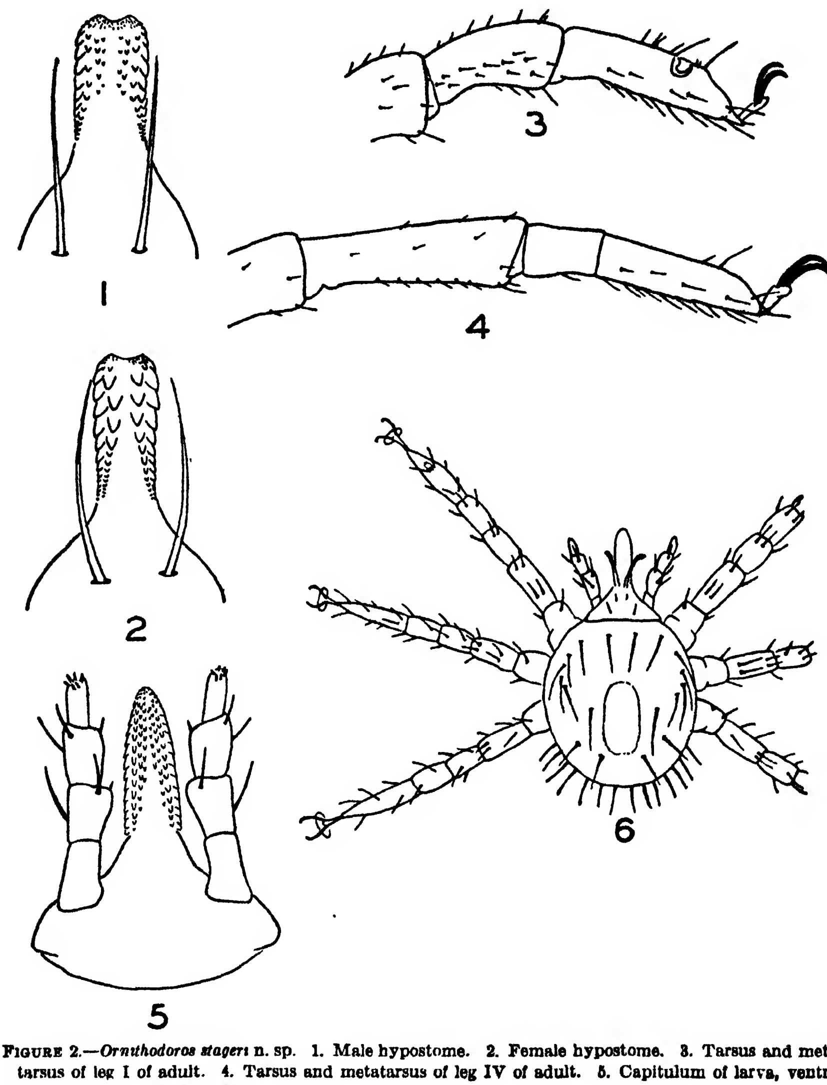

FIGURE 2.—*Ornithodoros stageri* n. sp. 1. Male hypostome. 2. Female hypostome. 3. Tarsus and metatarsus of leg I of adult. 4. Tarsus and metatarsus of leg IV of adult. 5. Capitulum of larva, ventral view. 6. Larva, dorsal view.

sexes. In the female the principal denticles, arranged 2/2, have the four files approximately equidistant, while in the male the hypostome is proportionately wider, has the denticles smaller with the two principal files separated by two short files of smaller denticles on each side of the median line.

Folds.—Coxal and supracoxal folds present.

Grooves.—Dorso-ventral groove absent; preanal, transverse postanal, and median postanal grooves present.

Sexual opening.—Placed at the level of the interval between coxae I and II.

Eyes.—Absent.

Anus.—In an elliptical pattern.

LARVA

Short oval, moderate in size. Length including hypostome 0.765 mm.; width 0.48 mm. With an oval area on the dorsum, which is shiny and with faint pits (visible with reflected light in unmounted specimens). Legs about as long as the length of the body, and with claws. Capitulum terminal and visible from above; basis broad. Hypostome lacking the distinct conical base found in some species (fig. 3–1); sides a little converging anteriorly, bluntly pointed apically. Denticles apically 4/4, then 3/3, and finally 2/2 at the base; those of the lateral files large, and those of the median files very small. Length of hypostome about 0.2 mm.

Holotype.—Female from A. P. 17868.

Allotype.—Male from A. P. 17868.

Paratypes.—29 females, 29 males, from A. P. 17868.

Holotype, allotype, and paratypes deposited in the collections of the Rocky Mountain Laboratory, except that single males and females have been deposited as follows: United States National Museum, Washington, D. C.; Zoological Division, Bureau of Animal Industry, Department of Agriculture, Washington, D. C.; Los Angeles County Museum, Los Angeles, Calif.; Division of Entomology and Parasitology, University of California, Berkeley, Calif.; Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; Department of Entomology, Cornell University, Ithaca, N. Y.; Division of Entomology and Economic Zoology, University of Minnesota, Minneapolis, Minn.; and Department of Entomology, Oklahoma Agricultural and Mechanical College, Stillwater, Okla.

This tick is named in honor of Mr. Kenneth E. Stager, Los Angeles, Calif.

Four collections of this species from Texas, Oklahoma, Arizona, and California, respectively, have been made as follows: A. P. 17798, Ney Cave, August 5, 1939, 20 miles north of Hondo, Tex., one male, one female, one nymph (Kenneth E. Stager); A. P. 17859, on bat guano in Senator Mine, May 21, 1940, 21 miles northeast of Yuma, Ariz. (in California), several adults and nymphs (Glen M. Kohls); A. P. 17868, rock crevices in mine tunnel, May 24, 1940, Picacho Mountain near Picacho, Ariz., numerous adults and nymphs (Glen

M. Kohls); A. P. 17017, bat cave, July 2, 1940, near Freedom, Okla., two nymphs, one larva (D. E. Howell).

Ornithodoros yumatensis n. sp.

Body.—Sides nearly parallel, a little pointed in front, and broadly rounded behind. Pattern of the mammillae continuous over the margins without change of pattern from dorsal to ventral surfaces. Size of holotype female 4.75 mm.×3.25 mm. Size of allotype male 3.8 mm.×2.25 mm. Largest and smallest females 5.6 mm.×3.5 mm. to 4.1 mm.×2.25 mm. Largest and smallest males 4.8 mm.×2.40 mm. to 3.6 mm.×2.0 mm.

Mammillae.—Moderate in size and number and about equal in sizes in the median and peripheral areas on both dorsal and ventral surfaces; close, but not crowded. Individual mammillae on the dorsum are conical and have irregular surfaces with irregular radial ridges. Short hairs, few in number, present mainly on the posterior and lateral borders. Individual mammillae on the venter are bent backward, mildly suggesting reptilian scales.

Discs.—Present but not conspicuous; moderate in size, superficial or very mildly depressed. Present also on the venter in lineal arrangement in the preanal, transverse postanal, and the median postanal grooves.

Legs.—Long and slender, with their surfaces made irregular by very numerous fine granulations. Dorsal subapical protuberances and dorsal humps absent. Leg hairs are numerous and small, except on the distal portions of the tarsi, where they are longer. Length of female tarsus I, 1.02 mm.; metatarsus 0.72 mm.; tarsus IV, 1.17 mm.; metatarsus 0.96 mm. Length of male tarsus I, 0.66 mm.; metatarsus 0.51 mm.; tarsus IV, 0.87 mm., metatarsus 0.72 mm.

Coxae.—Coxae I and II a little separated, all others contiguous.

Hood.—Indefinite. The anterior point of the dorsal body wall may represent the anterior end of the hood, but if this is true the hood is short and small.

Camerostome.—Indefinite.

Movable cheeks.—Large, about twice as long as wide.

Capitulum.—The capitulum is protrusile and when extended reaches beyond the anterior end of the body. When so extended, the basis capituli is seen to be twice as long as wide and its length is about equal to the length of the soft membrane which unites the capitulum with the body. Living specimens may show the capitulum either extended or withdrawn. Specimens preserved in alcohol which are not enlarged by recent feeding have the capitulum withdrawn. Basis capituli with the surface granular (as on the legs) and faintly wrinkled. Numerous hairs present at the sides on the anterior portion (not

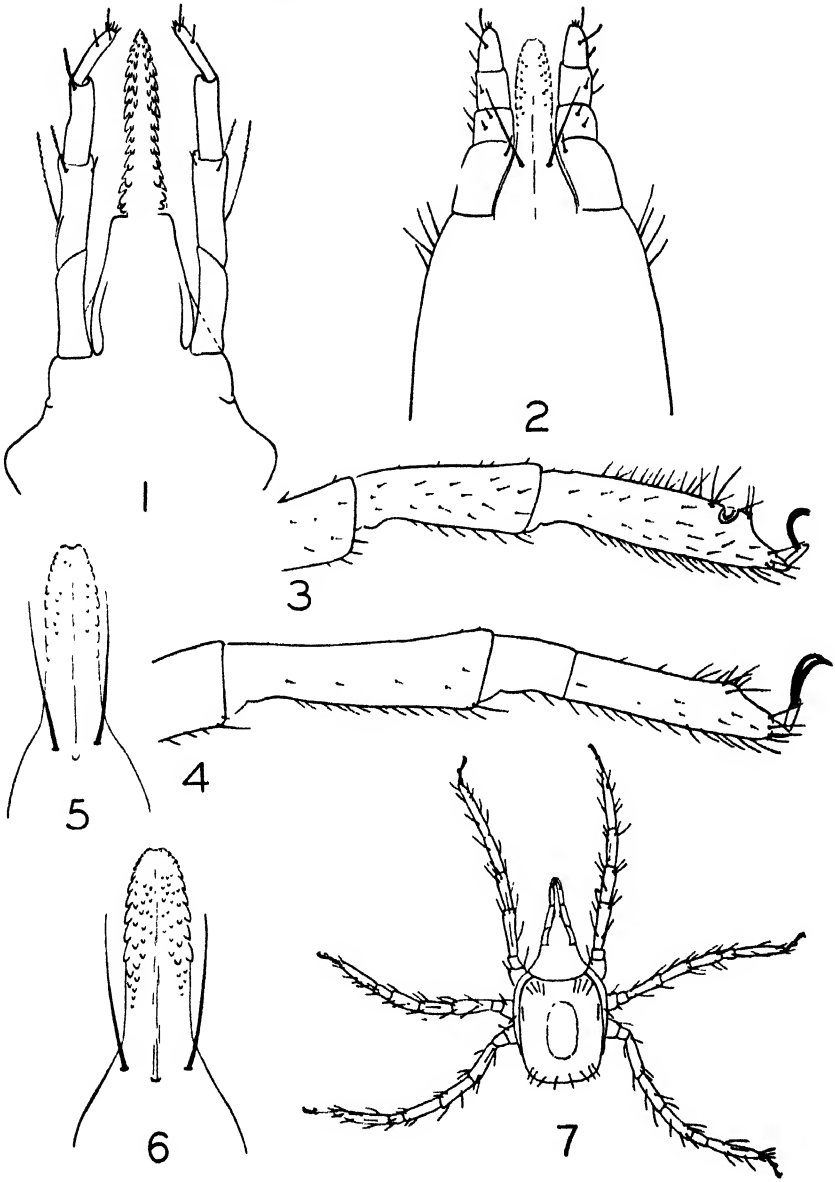

FIGURE 3.—*Ornithodoros yumatensis* n. sp 1. Capitulum of larva, ventral view. 2. Capitulum of nymph, ventral view. 3. Tarsus and metatarsus of leg I of adult. 4. Tarsus and metatarsus of leg IV of adult. 5. Male hypostome. 6. Female hypostome. 7. Larva, dorsal view.

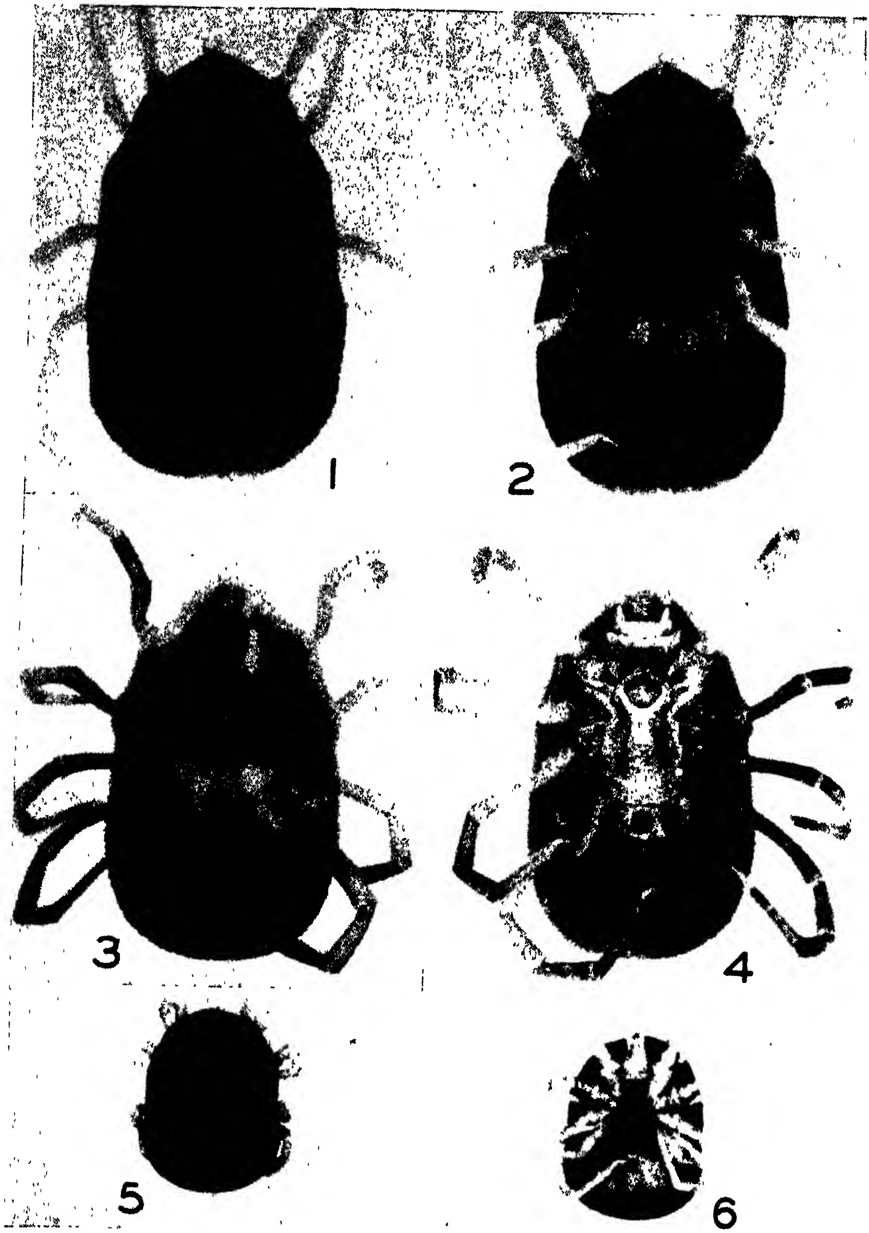

FIGURE 4.—1. *Ornithodoros stageri* n. sp., dorsal view. 2. *Ornithodoros stageri* n. sp., ventral view. 3. *Ornithodoros yumatensis* n. sp., dorsal view. 4. *Ornithodoros yumatensis* n. sp., ventral view. 5. *Ornithodoros eremicus* n. sp., dorsal view, nymph. 6. *Ornithodoros eremicus* n. sp., ventral view, nymph.

visible when the capitulum is withdrawn). Palpi tapering and with numerous hairs similar to those on the basis capituli. Tip of the hypostome reaching to the distal end of palpal article 3.

Hypostome.—Sides subparallel, apex notched. In both sexes the denticles are small or faint, largest in the lateral files and progressively smaller toward the median line. Length of hypostome, female 0.19 mm.; male 0.17 mm.

Folds.—Coxal and supracoxal folds present.

Grooves.—Preanal, transverse postanal, and median postanal grooves present. Dorso-ventral groove absent.

Sexual opening.—At the level of the interval between coxae I and II.

Eyes.—Absent.

Anus.—Large, in an elliptical pattern.

LARVA

Large, suboval. Length (including mouth parts) 1.20 mm., width 0.50 mm. Dorsal reticulated area is oval. Legs long, slender, and with claws. Capitulum terminal, large, its length equal to about half the entire length of the larva. Basis capituli large, visible from above, wider behind. Hypostome slender, long, pointed apically. Hypostome on a conical base which is about as long as the hypostome. Denticles apically, 3/3, then 2/2; those of the lateral (marginal) files large, those of the median files very small. Length of hypostome, 0.24 mm.

This species is rather closely related to *O. brodyi* Matheson 1935, but may be separated by the dentitions of the hypostomes and the characters of the individual mammillae. In the new species the latter are conical and have obvious radiating ridges on their sides, while in *brodyi* they are much flattened, smooth on top, and lack the radiating ridges.[2]

Holotype.—Female from A. P. 17881.

Allotype.—Male from A. P. 17881.

Paratypes.—25 females and 25 males from A. P. 17881.

Holotype female, allotype male, and paratypes at the Rocky Mountain Laboratory, except that single males and females have been deposited as follows: United States National Museum, Washington, D. C.; Zoological Division, Bureau of Animal Industry, Department of Agriculture, Washington, D. C.; Los Angeles County Museum, Los Angeles, Calif.; Division of Entomology and Parasitology, University of California, Berkeley, Calif.; Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; Department of Entomology, Cornell University, Ithaca, N. Y.; Division of Entomology and Economic Zoology, University of Minnesota, Minneapolis, Minn.

[2] In our studies of the numerous species of *Ornithodoros* in North America in the preparation of a monograph now nearing completion, we have found that the individual mammillae show little variation and are very dependable as characters.

The three known collections, all by Glen M. Kohls, are from California and Arizona as follows: A. P. 17856, from rock crevices in mine tunnel, May 20, 1940, 15 miles northeast of Yuma, Ariz. (in California), one male, two nymphs; A. P. 17881, from rock crevices in Crystal Cave, June 2, 1940, 10 miles southeast of Winkelman, Ariz., numerous adults and nymphs, few larvae; A. P. 17882, from bats, *Myotis velifer velifer*, in Crystal Cave, June 2, 1940, 10 miles southeast of Winkelman, Ariz., six adults and nymphs.

CONTEMPLATED REVISION OF THE TREASURY DEPARTMENT DRINKING WATER STANDARDS

The requirements for drinking (and culinary) water provided by common carriers for the use of passengers carried in interstate traffic, commonly known as the "Treasury Department Drinking Water Standards," were last revised in 1925 and published in the Public Health Reports of April 10 of that year. Since that time many improvements in water supply practice have been adopted with resulting increased uniformity of quality and safety to the consumer. The revision of the standards to conform more closely to current requirements for water supplies of attainable safety and potability is accordingly in order.

To carry out such a revision the Surgeon General has appointed a special advisory committee composed of representatives of various Federal organizations and scientific associations and several members at large. A smaller subcommittee of Public Health Service officers has been designated to prepare tentative suggestions for changes in the present standards which will be submitted for the consideration of the advisory committee.

The membership of the advisory committee, together with the name of the organization which each represents, is as follows:

American Chemical Society:
A. M. Buswell,
Chief, Illinois State Water Survey Division,
Urbana, Ill.

American Public Health Association:
Abel Wolman,
Professor of Sanitary Engineering,
Johns Hopkins University,
Baltimore, Md.

American Society of Civil Engineers:
Arthur E. Gorman,
Bureau of Engineering,
Department of Public Works,
Chicago, Ill.

American Water Works Association:
Charles R. Cox,
Chief, Bureau of Water Supply,
State Department of Health,
Albany, N. Y.

Society of American Bacteriologists:
A. C. Hunter,
Principal Bacteriologist,
Food and Drug Administration,
Federal Security Agency,
Washington, D. C.

Conference of State Sanitary Engineers:
Arthur D. Weston,
Director and Chief Engineer,
Division of Sanitary Engineering,
State Department of Health,
Boston, Mass.

Food and Drug Administration:
J. W. Sale,
Senior Chemist, Food Division,
Federal Security Agency,
Washington, D. C.

U. S. Geological Survey:
W. D. Collins,
Chemist in Charge,
Washington, D. C.

Association of American Railroads:
R. C. Bardwell,
Superintendent, Water Supply,
Chesapeake & Ohio Railway,
Richmond, Va.

Member at Large:
R. F. Goudey,
Sanitary Engineer,
Bureau of Water Works and Supply,
Los Angeles, Calif.

Member at Large:
R. E. Buchanan,
Director, Agricultural Experiment Station,
Iowa State College,
Ames, Iowa.

Member at Large:
Herman G. Baity,
Professor of Sanitary Engineering,
University of North Carolina,
Chapel Hill, N. C.

United States Public Health Service:
Chairman:
Joseph W. Mountin,
Assistant Surgeon General,
Domestic Quarantine Division.
Secretary:
J. K. Hoskins,
Chief, Sanitation Section,
Domestic Quarantine Division.

The subcommittee, officers of the Public Health Service, consists of the following members:

H. W. Streeter, Senior Sanitary Engineer, Stream Pollution Investigations, Cincinnati, Ohio.
C. C. Ruchhoft, Principal Chemist, Stream Pollution Investigations, Cincinnati, Ohio.
C. T. Butterfield, Principal Bacteriologist, Stream Pollution Investigations, Cincinnati, Ohio.
Lawrence T. Fairhall, Principal Industrial Toxicologist, National Institute of Health, Bethesda, Md.
R. E. Tarbett, Senior Sanitary Engineer, Domestic Quarantine Division, Washington, D. C.
Secretary:
J. K. Hoskins, Senior Sanitary Engineer, Chief, Sanitation Section, Domestic Quarantine Division, Washington, D. C.

URBAN HOUSING AND CROWDING [1]

On the basis of Health Survey data covering 631,429 households in 83 cities and towns in various geographic areas in the United States and within the recognized limitations of the index, crowding in urban households as measured by number of persons per room has been found to vary widely in extent and in intensity with geographic region, color, size of household, and with tenancy, type, rental charge, or estimated value of dwelling units. The problem was found not to be limited to large cities; it was present in communities of all size groups and to varying degrees in cities of like size in the same geographic area. When measured in terms of persons the percentage of crowding was higher than when measured in terms of households. The pro-

portion of young children living under crowded conditions was much greater than the corresponding proportion in other age groups.

Regional differences in crowding may be summarized in the general statement that crowded households were relatively much more frequent in the South than in other areas; the lowest percentage of crowded households was found in the West; the North Central region was most typical of national conditions; and the Northeast showed less crowding than the North Central area. There were relatively fewer crowded white households in each household-size group in the Northeast than the West, although the rate for all white households was lowest in the West.

Patently, colored homes were more subject to crowded conditions than were white. In every comparison made, the crowding rate for the colored significantly exceeded that for the white. Not only was the percentage of crowded colored households higher in all specific population groups, but the intensity, as measured by the differentials in the proportions in the three degree-of-crowding categories, was greater among the colored. While proportionately 2½ times as many colored as white households were in dwellings with more than one person per room, the ratio of colored to white households with more than two persons per room was 4 to 1.

Crowding showed a direct association with household size and dwelling rental or value. The percentage of crowded units among smaller households was nominal except in the very low, as indicated by dwelling rental or value, economic status groups. In the minimum rental or value groups a notable proportion of the smaller households showed crowding. The larger households were found to include a high proportion living under crowded conditions even among the higher rental or value groups. This was particularly true of households in rented dwellings.

The proportion of crowded households in rented dwellings was (depending on the degree-of-crowding category) from 2½ to 5½ times as great as in owner-occupied dwelling units. A wide difference between the relative frequency of crowded households in rented dwellings of the multiple and of the single type was apparent, the single type of dwelling unit being less frequently crowded than the multiple.

Since large households were much more frequently crowded, the percentage of persons living under crowded conditions was greater than the percentage of households so domiciled; furthermore, for this reason and since large households were likely to include younger

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[1] Britten, Rollo H., and Brown, J. E.: Urban housing and crowding: Relation to certain population characteristics as indicated by National Health Survey data. Public Health Bulletin No. 261. Available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents per copy.

children, the proportion of young children in crowded dwellings exceeded the proportion of persons in other age groups in crowded homes.

COURT DECISION ON PUBLIC HEALTH

Action by miner for injuries claimed to have resulted from inadequate ventilation of mine.—(Minnesota Supreme Court; *Applequist* v. *Oliver Iron Mining Co.*, 296 N.W. 13; decided January 17, 1941, rehearing denied January 30, 1941.) An action was brought by a miner to recover damages for personal injuries claimed to have been caused by the defendant mining company's failure to provide or maintain an adequate system of ventilation in its underground mines where he had been employed for several years. It was claimed that the miner had contracted "pneumoconiosis, sometimes called silicosis, and a serious lung ailment with other complications."

The statute relating to mines had its origin in a 1905 law, one section of which provided that, in case the inspector of mines found that a place was dangerous from any cause, it was his duty immediately to order the men engaged in work at the said place to quit work, to notify the person in charge to secure the place from the existing danger, and to specify the work to be done or change to be made to render the same secure, ordinary mine risks excepted. The so-called ventilating statute was first enacted in 1919 and one section of it provided that "all places of employment," as used in the law, should mean any place, either inside or outside, where any business or industry was carried on and in which persons were employed and should include, among other things, engineering works, but should not be construed to apply to domestic service or agricultural labor.

One question passed on by the Supreme Court of Minnesota was whether the ventilating statute was applicable in the instant case, the defendant claiming that the said statute did not apply to underground mining but that the mining statute alone applied. The appellate court, however, did not agree with the defendant's contention, saying that it thought that the ventilating statute was an addition to and an enlargement of the duties cast upon industry in general, for the obvious purpose, so far as practicable, of protecting those employed by it; that it applied to underground mining; and that where, as in the instant case, an underground miner became afflicted with a disabling ailment, not covered by the compensation act, through negligence of the employer amounting to the omission of a statutory duty, viz, the failure of the employer properly to ventilate an underground mine where the employee worked, such employee had an action at law for damages.

DEATHS DURING WEEK ENDED MARCH 8, 1941

From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 8, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9, 101	9, 365
Average for 3 prior years	9, 383	
Total deaths, first 10 weeks of year	96, 749	96, 048
Deaths under 1 year of age	548	460
Average for 3 prior years	526	
Deaths under 1 year of age, first 10 weeks of year	5, 488	5, 306
Data from industrial insurance companies:		
Policies in force	64, 655, 691	66, 069, 866
Number of death claims	13, 532	15, 103
Death claims per 1,000 policies in force, annual rate	10. 9	12. 0
Death claims per 1,000 policies, first 10 weeks of year, annual rate	10. 9	10. 7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 15, 1941

Summary

The only item of significance in the current weekly reports of the 9 communicable diseases included in the following table is the incidence and increase in the number of cases of measles. A total of 43,060 cases was reported for the current week, as compared with 34,420 for the preceding week and with 31,490 for the next earlier week. The current figure may be compared with 43,622 cases reported for the corresponding week in 1938, the highest number reported for the week since 1935. In 1938, the latest "measles year," the peak of 44,191 cases was reached during the week ended March 26.

The Middle Atlantic, East North Central, and South Atlantic States continue to report the highest incidence of measles, and the New England, Middle Atlantic, West South Central, and Pacific areas reported more cases for the current week than for the corresponding week of 1938.

The current figures for only measles and whooping cough were above the 5-year (1936–40) median, while those for diphtheria, scarlet fever, smallpox, and typhoid fever were below those reported for the corresponding week in each of the preceding 5 years. Only 11 cases of poliomyelitis were reported, of which 3 occurred in Florida. Of 65 cases of smallpox, 55 cases were reported in 8 States of the North Central areas, while no cases were reported in the New England, Middle Atlantic, or South Atlantic States. One case of Rocky Mountain spotted fever was reported in Montana and 1 case of undulant fever in Utah. One case of endemic typhus fever was reported in Oregon, and 23 cases were reported from the Southern States.

The death rate for the current week for 92 major cities in the United States was 12.7 per 1,000 population, the same as for the preceding week. The 3-year (1938–40) average for 88 cities is 12.8.

Telegraphic morbidity reports from State health officers for the week ended March 15, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Mar. 15, 1941	Mar. 16, 1940		Mar. 15, 1941	Mar. 16, 1940		Mar. 15, 1941	Mar. 16, 1940		Mar. 15, 1941	Mar. 16, 1940	
NEW ENG.												
Maine	0	2	2	1	12	12	94	356	202	0	1	1
New Hampshire	0	0	0	3	------	------	23	30	30	0	0	0
Vermont	0	0	0	------	------	------	18	4	46	0	0	0
Massachusetts	2	2	3	------	------	------	811	311	864	2	0	2
Rhode Island	0	0	0	------	------	------	5	138	82	1	1	1
Connecticut	1	1	2	4	7	18	61	156	156	0	1	1
MID. ATL.												
New York	12	15	34	[1] 54	33	[1] 38	7,605	383	1,408	3	2	3
New Jersey	10	4	11	36	23	23	2,549	280	280	0	0	1
Pennsylvania	17	11	40	------	------	------	4,958	40	322	7	7	7
E. NO. CEN.												
Ohio	6	12	24	98	217	48	5,704	17	252	2	2	3
Indiana	21	6	12	39	61	61	627	8	14	1	0	2
Illinois	24	21	35	44	35	35	4,152	113	70	4	3	3
Michigan [2]	3	9	9	33	23	5	4,416	178	178	1	5	0
Wisconsin	0	2	2	200	224	67	838	267	267	0	1	1
W. NO. CEN.												
Minnesota	0	14	4	29	1	1	11	179	179	0	0	0
Iowa	6	2	3	136	28	8	175	196	133	0	0	1
Missouri	6	20	16	11	16	253	151	9	13	1	0	1
North Dakota	2	6	2	21	44	44	13	6	6	0	0	0
South Dakota	0	1	0	6	2	2	27	1	2	0	0	0
Nebraska	2	0	2	15	------	4	6	107	46	0	1	1
Kansas	2	11	9	13	31	40	661	533	20	1	0	0
SO. ATL.												
Delaware	0	0	0	------	------	------	351	4	32	0	0	0
Maryland [3]	3	5	5	41	57	57	170	3	199	1	1	2
Dist. of Col.	5	6	7	5	------	3	126	5	39	1	0	0
Virginia	14	10	20	1,077	552	552	1,971	44	220	2	3	3
West Virginia [2]	10	4	9	125	610	218	338	17	17	1	1	2
North Carolina [3]	7	16	13	83	8	172	921	141	167	0	0	1
South Carolina [3]	6	2	5	754	774	872	278	7	37	1	0	0
Georgia [3]	9	11	9	257	144	286	421	254	205	2	1	2
Florida [3]	6	1	8	159	9	9	973	92	92	0	0	3
E. SO. CEN.												
Kentucky	4	3	12	135	69	93	1,317	25	110	1	0	6
Tennessee	4	6	9	161	238	416	339	95	165	2	0	5
Alabama [3]	6	14	8	316	335	1,862	481	124	124	2	3	7
Mississippi [2,3]	8	3	4	------	------	------	------	------	------	2	0	1
W. SO. CEN.												
Arkansas	9	7	7	291	334	334	238	36	36	0	0	0
Louisiana	5	1	12	76	62	62	61	26	26	2	1	1
Oklahoma	12	3	6	207	491	343	14	7	12	2	1	1
Texas [3]	29	36	36	1,167	1,761	1,677	767	811	475	0	1	4
MOUNTAIN												
Montana [4]	7	0	1	11	11	25	5	31	18	1	0	0
Idaho	1	0	0	------	2	4	44	39	13	0	0	0
Wyoming	1	0	0	------	5	------	19	19	19	0	0	0
Colorado	10	6	8	44	29	------	214	30	30	0	0	0
New Mexico	5	1	4	5	7	21	187	37	37	0	0	1
Arizona	0	2	2	105	224	224	136	95	57	0	0	0
Utah [2]	0	2	1	22	8	------	32	315	105	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	1	------	------
PACIFIC												
Washington	2	1	1	16	11	5	79	653	257	1	0	1
Oregon	1	10	1	21	31	72	442	421	45	0	0	0
California [2]	13	26	30	404	211	211	231	533	609	1	3	3
Total	291	315	458	6,225	6,740	8,852	43,060	7,178	11,626	46	39	66
11 weeks	3,233	4,379	5,956	556,322	140,504	85,103	222,361	59,774	80,967	499	428	1,009

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 15, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Mar. 15, 1941	Mar. 16, 1940		Mar. 15, 1941	Mar. 16, 1940		Mar. 15, 1941	Mar. 16, 1940		Mar. 15, 1941	Mar. 16, 1940	
NEW ENG.												
Maine	0	0	0	7	11	17	0	0	0	0	0	0
New Hampshire	0	0	0	3	0	7	0	0	0	0	0	0
Vermont	0	0	0	8	8	8	0	0	0	0	0	0
Massachusetts	0	1	0	168	102	287	0	0	0	1	2	2
Rhode Island	0	0	0	5	18	18	0	0	0	0	0	0
Connecticut	0	0	0	52	89	130	0	0	0	1	0	0
MID ATL.												
New York	0	2	2	524	1,049	1,049	0	0	0	5	3	4
New Jersey	0	0	0	330	358	239	0	0	0	1	3	1
Pennsylvania	0	2	1	338	257	514	0	0	0	6	6	6
E. NO. CEN.												
Ohio	0	1	1	256	343	343	0	0	1	2	4	2
Indiana	0	0	0	191	275	264	5	1	5	1	1	1
Illinois	0	0	1	516	870	870	14	2	13	0	2	4
Michigan [2]	0	2	0	252	383	442	3	0	2	0	3	3
Wisconsin	1	1	0	166	153	186	7	3	5	1	0	1
W. NO. CEN.												
Minnesota	0	0	0	59	88	135	5	1	9	0	1	1
Iowa	0	0	0	65	62	233	1	4	23	0	1	1
Missouri	0	0	0	86	102	216	19	2	8	4	5	2
North Dakota	0	0	0	21	14	29	0	6	6	0	0	0
South Dakota	0	0	0	11	5	16	0	1	4	0	0	0
Nebraska	0	0	0	24	20	30	0	1	11	1	0	0
Kansas	0	1	0	52	67	189	1	0	14	0	0	1
SO. ATL.												
Delaware	0	0	0	16	17	6	0	0	0	0	0	
Maryland [2]	0	0	0	36	42	47	0	0	0	1	2	1
Dist. of Col	0	0	0	32	18	18	0	0	0	0	0	0
Virginia	0	0	0	48	36	36	0	0	0	1	2	3
West Virginia [2]	1	0	0	47	50	58	0	0	0	2	0	2
North Carolina [3]	0	1	0	34	26	41	0	0	1	0	0	1
South Carolina [3]	0	0	0	5	3	3	0	0	0	10	2	1
Georgia [3]	0	0	0	14	17	17	0	5	0	3	3	3
Florida [3]	3	0	0	8	5	10	0	0	0	4	1	2
E. SO. CEN.												
Kentucky	0	1	0	151	94	68	0	0	0	2	1	2
Tennessee	1	0	0	154	81	55	1	1	0	3	2	2
Alabama [3]	1	0	0	26	23	15	1	0	0	5	2	2
Mississippi [2] [3]	0	0	0	6	5	5	2	1	0	1	2	2
W. SO. CEN.												
Arkansas	1	1	1	7	2	10	0	3	2	3	2	2
Louisiana	1	1	0	14	14	13	0	1	3	5	9	9
Oklahoma	0	0	0	13	15	25	0	27	15	1	5	2
Texas [3]	0	3	1	58	39	94	2	2	5	2	3	14
MOUNTAIN												
Montana [4]	1	0	0	38	26	28	0	0	9	0	0	0
Idaho	0	0	0	11	10	22	0	0	3	[5] 9	1	1
Wyoming	0	0	0	11	6	10	0	0	0	1	0	0
Colorado	0	0	0	51	29	57	1	10	6	0	0	0
New Mexico	0	0	0	5	13	30	0	2	0	0	8	2
Arizona	0	0	0	3	10	10	0	0	0	2	0	1
Utah [2]	0	0	0	16	27	35	0	1	1	0	1	0
Nevada	0	------	------	1	------	------	1	------	------	0	------	------
PACIFIC												
Washington	0	0	0	12	53	47	0	0	10	0	3	2
Oregon	0	1	0	11	24	39	2	0	18	1	3	1
California [2]	1	2	2	170	193	239	0	2	18	5	5	5
Total	11	20	20	4,131	5,152	6,205	65	76	327	84	88	101
11 weeks	317	307	228	38,482	51,089	67,405	522	810	3,297	[5] 833	827	1,213

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 15, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Whooping cough, Week ended Mar. 15, 1941	Whooping cough, Week ended Mar. 16, 1940	Division and State	Whooping cough, Week ended Mar. 15, 1941	Whooping cough, Week ended Mar. 16, 1940
NEW ENG.			E. SO. CEN.		
Maine	13	32	Kentucky	102	51
New Hampshire	11	5	Tennessee	59	40
Vermont	7	35	Alabama [3]	36	31
Massachusetts	227	171	Mississippi [2] [3]		
Rhode Island	18	6			
Connecticut	66	29	W. SO. CEN.		
			Arkansas	11	2
MID. ATL.			Louisiana	2	30
New York	318	319	Oklahoma	21	3
New Jersey	128	86	Texas [3]	256	208
Pennsylvania	402	225			
			MOUNTAIN		
E. NO. CEN.			Montana [4]	28	5
Ohio	421	235	Idaho	19	28
Indiana	25	47	Wyoming	0	3
Illinois	83	92	Colorado	57	6
Michigan [2]	351	188	New Mexico	16	53
Wisconsin	97	102	Arizona	20	14
			Utah [2]	92	123
W. NO. CEN.			Nevada	2	
Minnesota	95	23			
Iowa	51	5	PACIFIC		
Missouri	65	31	Washington	84	61
North Dakota	8	3	Oregon	7	30
South Dakota	14	0	California [5]	463	241
Nebraska	7	3			
Kansas	102	57	Total	4,587	3,103
SO. ATL.			11 weeks	46,813	31,804
Delaware	5	5			
Maryland [2]	72	210			
Dist. of Col	9	15			
Virginia	98	52			
West Virginia [2]	55	62			
North Carolina [3]	340	108			
South Carolina [3]	123	14			
Georgia [3]	83	9			
Florida [3]	18	5			

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended March 15, 1941, 24 cases as follows: North Carolina, 2, South Carolina, 2; Georgia, 9; Florida, 4, Alabama, 2; Mississippi, 2; Texas, 2; California, 1.
[4] Rocky Mountain spotted fever, week ended March 15, 1941, Montana, 1 case.
[5] Delayed report has been received of the earlier occurrence of 13 cases of typhoid fever in Idaho.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 1, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5 year average	139	948	137	5,381	917	2,085	29	394	20	1,120	-------
Current week[1]	90	598	84	13,319	555	1,369	3	377	18	1,146	-------
Maine:											
Portland	0	-------	0	5	7	3	0	1	0	12	21
New Hampshire:											
Concord	0	-------	0	0	0	1	0	0	0	0	9
Manchester	0	-------	0	0	1	2	0	0	0	0	11
Nashua	0	-------	0	0	0	1	0	0	0	1	9
Vermont:											
Barre	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Burlington	0	-------	0	0	0	0	0	0	0	0	10
Rutland	0	-------	0	0	2	0	0	0	0	0	7
Massachusetts:											
Boston	1	-------	2	239	8	44	0	10	0	93	226
Fall River	0	-------	0	0	1	19	0	0	0	6	28
Springfield	0	-------	0	1	1	0	0	0	0	1	40
Worcester	0	-------	0	104	6	4	0	0	0	13	53
Rhode Island:											
Pawtucket	0	-------	0	0	0	0	0	0	0	0	15
Providence	0	2	1	4	9	4	0	1	0	12	67
Connecticut:											
Bridgeport	0	-------	0	1	6	4	0	2	0	4	37
Hartford	1	-------	0	1	3	1	0	4	1	5	49
New Haven	0	2	0	0	0	13	0	0	0	7	54
New York:											
Buffalo	0	-------	2	54	12	23	0	5	0	16	139
New York	17	68	2	4,252	96	256	0	89	4	98	1,632
Rochester	0	-------	0	15	4	1	0	1	0	2	60
Syracuse	0	-------	0	0	2	0	0	1	0	9	53
New Jersey:											
Camden	2	1	0	35	2	9	0	4	0	5	20
Newark	0	11	0	251	8	47	0	3	0	21	115
Trenton	0	3	0	17	2	64	0	2	0	0	46
Pennsylvania:											
Philadelphia	2	4	1	1,462	35	109	0	34	1	51	529
Pittsburgh	0	5	1	92	11	10	0	10	0	56	184
Reading	0	-------	0	299	4	0	0	2	0	5	36
Scranton	0	-------	-------	1	-------	1	0	-------	0	0	-------
Ohio:											
Cincinnati	5	7	3	77	7	14	0	5	0	2	144
Cleveland	0	48	3	1,981	15	49	0	8	0	65	223
Columbus	1	1	1	62	1	19	0	2	0	25	107
Toledo	0	5	3	22	8	0	0	2	0	4	84
Indiana:											
Anderson	0	-------	0	0	1	0	0	0	0	0	18
Fort Wayne	0	-------	0	38	4	1	0	1	0	0	31
Indianapolis	2	-------	0	89	16	24	0	3	0	3	114
Muncie	0	-------	0	3	3	13	0	0	0	0	17
South Bend	0	-------	0	10	2	1	0	0	0	0	15
Terre Haute	0	-------	1	0	2	1	0	0	0	0	18
Illinois:											
Alton	0	-------	0	0	0	3	0	0	0	0	8
Chicago	16	18	5	1,913	33	203	0	29	2	37	710
Elgin	1	-------	0	32	3	0	0	0	0	0	8
Moline	0	-------	0	10	0	0	0	0	0	1	10
Springfield	1	-------	0	0	4	6	0	0	0	2	28
Michigan:											
Detroit	6	16	3	980	12	129	0	13	1	123	303
Flint	1	-------	0	38	6	6	0	0	0	10	29
Grand Rapids	0	-------	1	97	1	6	0	0	0	9	37
Wisconsin:											
Kenosha	0	-------	0	61	0	0	0	0	0	4	6
Madison	0	-------	0	14	0	3	0	0	0	3	20
Milwaukee	0	1	1	81	10	24	0	0	0	41	120
Racine	0	-------	0	5	0	7	0	0	0	2	14
Superior	0	-------	1	0	0	5	0	0	0	6	9

[1] Figures for Barre and Boise estimated; reports not received.

City reports for week ended March 1, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0	------	1	0	1	1	3	0	0	3	23
Minneapolis	0	11	2	0	3	14	0	1	0	27	112
St. Paul	0	1	1	1	1	4	0	3	1	11	58
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	0	------
Davenport	0	------	------	0	------	0	1	------	0	0	------
Des Moines	0	------	------	0	------	8	0	------	0	1	35
Sioux City	0	------	------	0	------	3	0	------	0	9	------
Waterloo	0	------	------	1	------	1	0	------	0	1	------
Missouri:											
Kansas City	0	------	1	5	7	20	0	5	0	11	92
St. Joseph	1	------	0	3	3	0	0	0	0	1	22
St. Louis	3	6	3	46	27	68	0	14	0	32	200
North Dakota:											
Fargo	0	------	0	0	1	1	0	0	0	7	3
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	------	1	------	0	0	------	0	5	3
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	0	------
Sioux Falls	1	------	------	0	------	0	0	------	0	0	10
Nebraska:											
Lincoln	0	------	------	2	------	7	0	------	0	0	------
Omaha	0	------	1	1	5	3	0	1	0	1	61
Kansas:											
Lawrence	0	2	0	62	1	0	0	0	0	0	3
Topeka	0	------	0	65	1	4	0	1	0	3	7
Wichita	0	2	0	0	5	1	0	0	0	20	31
Delaware:											
Wilmington	0	------	0	161	0	2	0	0	0	1	33
Maryland:											
Baltimore	0	13	3	24	25	30	0	15	0	60	249
Cumberland	0	------	0	0	1	0	0	0	0	0	12
Frederick	0	------	1	0	0	0	0	0	0	0	4
Dist. of Col.:											
Washington	2	15	3	67	10	11	0	13	0	11	178
Virginia:											
Lynchburg	0	------	0	2	0	1	0	0	1	0	13
Norfolk	0	77	2	58	2	2	0	1	0	0	25
Richmond	0	------	4	13	6	2	0	0	0	0	49
Roanoke	0	------	------	262	------	2	0	------	0	2	15
West Virginia:											
Charleston	0	6	0	75	0	2	0	0	0	1	19
Huntington	0	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	0	4	0	0	1	0	3	20
North Carolina:											
Gastonia	0	------	------	5	------	0	0	------	0	7	------
Raleigh	0	------	1	43	6	0	0	0	0	23	13
Wilmington	0	------	0	0	3	0	0	0	0	0	15
Winston-Salem	0	10	2	2	2	2	0	3	0	19	25
South Carolina:											
Charleston	0	42	0	45	3	0	0	2	2	0	19
Florence	0	------	1	0	5	0	0	0	0	0	18
Greenville	0	------	0	49	9	1	0	0	0	11	32
Georgia:											
Atlanta	1	10	6	14	3	5	0	1	0	2	96
Brunswick	0	1	1	2	1	1	0	0	0	1	5
Savannah	0	172	4	3	1	2	0	2	0	0	44
Florida:											
Miami	0	10	1	11	2	0	0	2	2	7	57
Tampa	0	1	0	1	2	1	0	0	0	0	39
Kentucky:											
Ashland	0	1	0	0	2	0	0	1	0	0	9
Covington	0	1	0	34	0	0	0	0	0	1	15
Lexington	0	------	0	4	5	0	0	0	0	1	19
Louisville	0	16	0	74	3	52	0	5	0	15	60
Tennessee:											
Knoxville	0	1	1	20	2	5	0	1	0	5	29
Memphis	0	1	3	38	6	4	0	6	0	17	94
Nashville	0	------	1	21	6	4	0	1	0	3	51
Alabama:											
Birmingham	1	65	1	63	7	1	0	4	0	4	69
Mobile	1	1	2	5	1	1	0	0	0	0	23
Montgomery	0	3	------	21	------	2	0	------	0	1	------
Arkansas:											
Fort Smith	0	2	------	4	------	0	0	------	0	0	------
Little Rock	0	------	3	1	5	4	0	5	0	1	47

City reports for week ended March 1, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	4
New Orleans	2	5	4	1	13	4	0	13	0	10	156
Shreveport	1	------	0	0	4	1	0	4	1	0	50
Oklahoma:											
Oklahoma City	0	13	0	0	8	1	0	0	0	0	40
Tulsa	0	------	0	0	5	3	0	0	0	11	34
Texas:											
Dallas	6	1	1	7	4	8	0	1	1	5	84
Fort Worth	1	------	7	78	6	3	0	0	0	1	33
Galveston	0	------	0	0	2	0	0	2	0	0	21
Houston	2	1	1	0	10	2	0	7	0	0	97
San Antonio	2	6	1	0	5	0	0	3	0	5	63
Montana:											
Billings	0	------	0	0	0	1	0	0	0	0	4
Great Falls	0	------	0	1	2	2	0	1	0	0	10
Helena	0	------	0	1	0	0	0	0	0	0	4
Missoula	0	------	0	0	3	0	0	0	0	0	8
Idaho:											
Boise	------	------	------	------	------	------	------	------	------	------	------
Colorado:											
Colorado Springs	0	------	0	3	0	3	0	1	0	1	10
Denver	8	11	0	44	3	5	0	4	2	28	95
Pueblo	0	------	0	1	1	1	0	0	0	1	13
New Mexico:											
Albuquerque	0	1	0	8	0	0	0	0	0	0	5
Utah:											
Salt Lake City	0	------	0	3	1	1	0	1	1	5	29
Washington:											
Seattle	4	------	0	3	3	8	0	4	0	11	101
Spokane	0	1	1	5	2	1	0	0	0	0	40
Tacoma	0	------	0	0	2	0	0	1	0	5	42
Oregon:											
Portland	0	1	0	21	1	4	0	1	0	0	79
Salem	0	------	------	1	------	0	0	------	0	1	------
California:											
Los Angeles	0	37	3	20	10	24	0	13	0	34	356
Sacramento	1	------	0	1	2	4	0	2	0	11	37
San Francisco	0	2	1	5	11	9	0	12	0	22	233

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Connecticut:				**Maryland:**			
Bridgeport	1	1	0	Baltimore	1	1	
New York:				**District of Columbia:**			
New York	1	2	1	Washington	1	1	1
Pennsylvania:				**Georgia:**			
Philadelphia	1	0	0	Atlanta	0	0	1
Scranton	1	0	0	**Kentucky:**			
Ohio:				Covington	0	0	1
Cleveland	1	0	0	**Oklahoma:**			
Michigan:				Oklahoma City	1	0	0
Detroit	1	0	0	**Texas:**			
Minnesota:				Galveston	1	0	0
St. Paul	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 4; Pittsburgh, 1; Minneapolis, 1; Denver, 1.
Pellagra.—Cases: Kansas City, Mo., 1; Savannah, 1.
Typhus fever.—Cases: Savannah, 2; Dallas, 1. Deaths: Los Angeles, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 8, 1941.—During the week ended February 8, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		5	2	4	14	1	1	2	5	34
Chickenpox		7		102	307	30	16	18	88	568
Diphtheria		16		12	1	5	5			39
Dysentery				8						8
Influenza		54			184	9			76	323
Measles		261	164	364	756	190	603	438	934	3,710
Mumps				119	126	20	5	10	34	314
Pneumonia		15			13	4	1		30	63
Poliomyelitis				1						1
Scarlet fever		26	4	119	147	4	7	20	4	331
Tuberculosis	2	6	14	58	37	2	1			120
Typhoid and paratyphoid fever				16	4					20
Whooping cough				153	140	6	4	7	21	331

FINLAND

Communicable diseases—4 weeks ended December 31, 1940.—During the 4 weeks ended December 31, 1940, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	211	Poliomyelitis	23
Influenza	14,508	Scarlet fever	341
Paratyphoid fever	201	Typhoid fever	64

SWEDEN

Notifiable diseases—December 1940.—During the month of December 1940, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Diphtheria	47	Scarlet fever	921
Dysentery	1	Syphilis	23
Epidemic encephalitis	3	Typhoid fever	6
Gonorrhea	756	Undulant fever	12
Paratyphoid fever	18	Weil's disease	1
Poliomyelitis	19		

YUGOSLAVIA

Notifiable diseases—4 weeks ended December 29, 1940.—During the 4 weeks ended December 29, 1940, certain notifiable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	8	1	Paratyphoid fever	19	1
Cerebrospinal meningitis	90	30	Poliomyelitis	1	
Diphtheria and croup	581	47	Scarlet fever	257	7
Dysentery	107	13	Sepsis	10	3
Erysipelas	133	7	Tetanus	21	11
Favus	21		Typhoid fever	374	42
Lethargic encephalitis	2	2	Typhus fever	5	

X

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

Vol. 56 • MARCH 28, 1941 • No. 13

ILLNESS AND ACCIDENTS AMONG PERSONS LIVING UNDER DIFFERENT HOUSING CONDITIONS *

Data Based on the National Health Survey

By ROLLO H. BRITTEN, *Senior Statistician*, and ISIDORE ALTMAN, *Research Analyst, United States Public Health Service*

CONTENTS

I. INTRODUCTION

With growing national interest in housing, expanding Federal and local programs of slum clearance and rehabilitation, and an upswing in public and private building construction, more and more attention is being paid to the relation between housing and health. That substandard housing and a low level of health will be found together goes almost without saying; but the measurement of this association and of the specific directions it takes are fraught with difficulties. Winslow, DallaValle, and Britten, among others,[1] have already pointed out how extremely difficult it is to evaluate the effect of poor housing per se on health. Innumerable other factors, chiefly economic and sociological, are so deeply involved in the subject that their effect can at best be only partially eliminated. Hence, this paper and others of its type must be confined to tracing the association between health and housing without attempting to establish with any finality the degree of responsibility that housing itself has for poor health.

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*From the Environmental Sanitation Section, Division of Public Health Methods, National Institute of Health. Acknowledgment is made to various members of the Division staff for assistance in the preparation of this article. The authors are particularly grateful to Dr. J. M. DallaValle and Mr. James S. Fitzgerald for technical and editorial assistance. Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Projects Nos. 712159-658/9999 and 765-23-3-10.

[1] Britten, Rollo H.: The relation between housing and health. Pub. Health Rep., 49: 1301-1313 (1934).

DallaVelle, J. M.: Some factors which affect the relationship between housing and health. Pub. Health Rep., 52: 989-998 (1937).

Winslow, C.-E. A.: Housing as a public health problem. Am. J. Pub. Health, 27: 56-61 (1937).

Britten, Rollo H.: Housing and health. Am. J. Pub. Health, 28: 957-960 (1938).

Items enumerated in the National Health Survey [2]—amount and nature of illnesses experienced in the household during the 12 months immediately preceding the enumerator's visit, annual family income and relief status, ages of the household members, number of rooms in the dwelling unit, its monthly rental or estimated value, and kind of toilet facilities present—make possible a fairly detailed study of some aspects of this association. Some of the major findings have already appeared in an introductory paper.[3]

The comparisons in this report are confined to the urban data and to the white population.[4] With the exception of two tables (tables 3 and 4) concerned with illnesses from which a person was disabled on the day of the enumerator's visit, the data are restricted to illnesses disabling for 7 consecutive days or longer.[5] A disabling illness was defined as one that kept a person from his usual activities—work, school, care of the home, or other pursuits—by reason of disease, accident, or physical or mental impairment.

II. ILLNESS AND CROWDING [6]

In a comparison of illness rates at different crowding levels, degree of crowding is to be considered as standing for housing quality generally; that is to say, congested households will tend to be poorly housed in other respects also, and will tend to be representative of the neighborhoods in which they are most likely to be found, in slums and blighted areas. It follows, however, that crowding is also a crude

[2] A previous article (Perrott, G. St. J., Tibbitts, C., and Britten, R. H.: The National Health Survey. Scope and method of the Nation-wide canvass of sickness in relation to its social and economic setting. Pub. Health Rep., 54: 1663-1687 (1939)), has already described the scope, method, and purpose of the National Health Survey, a project conducted by the United States Public Health Service during the winter of 1935-36, in which some 2,500,000 persons in 700,000 households were covered by the house-to-house-canvass method in 83 cities in 18 States (The National Health Survey also covered about 140,000 persons in 37,000 households in 23 rural areas.) The total urban surveyed population was so distributed as to give a sample which was, in general, representative of cities in the United States according to size and region In large cities (100,000 population and over) the population to be canvassed was determined by a random selection of many small districts based on those used in the U. S. Census of 1930. In the smaller cities selected for study, the population was enumerated completely.

The Health Survey schedule is reproduced in the article just cited. The article also contains explanations of many of the terms employed in the present report, of which only the most pertinent will be repeated.

[3] Britten, R. H., Brown, J. E., and Altman, I: Certain characteristics of urban housing and their relation to illness and accidents: Summary of findings of the National Health Survey. Milbank Memorial Fund Quarterly, 18: 91-113 (April 1940).

There will be certain discrepancies between the data presented in the introductory paper and in the present one, owing to the fact that here the data have been further refined by adjustment to a standard age and household-size composition. (See pp. 612-613.)

[4] Except for the inclusion of colored persons in the section on home accidents, where no breakdown by color was made.

[5] Confinements, hospital cases, and fatal cases of any duration are included in the definition The number of cases in these categories which disabled for less than 7 days constitute a nominal portion (2.3 percent) of all illnesses coded as disabling for a week or longer.

[6] A detailed description of the characteristics of the health survey population with respect to crowding will be found in Britten, R. H., and Brown, J. E.: Urban housing and crowding: Relation to certain population characteristics as indicated by National Health Survey data. Pub. Health Bull. No. 261. U. S. Government Printing Office, 1941.

For data classified by city, see Adequacy of urban housing in the United States as measured by degree of crowding and type of sanitary facilities. National Health Survey, Preliminary Reports, Sickness and Medical Care Series, Bulletin No. 5, Division of Public Health Methods, National Institute of Health, U.S. Public Health Service, Washington, 1938.

measure of economic status, the inverse correlation between income and crowding being high. In most of the tables that follow the effect of income is partially eliminated by making comparisons of illness rates within fairly specific income groups.

Degree of crowding as an index of the quality of housing has one further limitation that should be pointed out: Overcrowding among higher-income groups, say above the $1,500 level, can hardly have the same significance as in a group which has not the means to supply itself with decent housing. To overcome this limitation, attention is centered upon the lower-income groups.

Crowding, with "persons per room" as its measure,[7] is for the purposes of this report divided into three categories: One person or less per room, more than one person per room but not more than one and a half, more than one and a half persons per room.[8] For convenience, these categories are referred to hereafter as *A*, *B*, and *C*, respectively; and, to facilitate comparisons among these three degrees of crowding, ratios of the rates in categories *B* and *C* to those in category *A* are presented in most of the tables on crowding and illness, with the rate in category *A* expressed as 100. From appendix table 1, in which the population used in the sections of this paper on crowding is classified by economic status,[9] age, and degree of crowding, the distribution of this population among the three categories may be readily computed. Thus, for all incomes and ages the percentage distribution was:

A. One person or less per room	74.9
B. More than 1 person per room but not more than 1½	16.7
C. More than 1½ persons per room	8.3
	100.0

As was stated in the introductory article referred to (see footnote 3), it is important to emphasize the fact that the degree-of-crowding classification is employed with no intention of fixing an exact line of demarcation between crowded and uncrowded households. If an attempt were made to establish such a line of demarcation, certain

[7] The number of persons per room, which was calculated separately for each household, is the ratio of the total number of persons in the household to the total number of rooms in the dwelling unit or abode in which the household resided. In determining the number of rooms, kitchens were included, baths, basements, and attics not used for living quarters were excluded.

The *household* in the Health Survey was a group of persons (or one person) living in a dwelling unit such as a house, apartment, rooming house, dormitory, nurses' home, or room or suite in a hotel. The household included all persons who resided (slept) in the abode. *Family*, as used in reports of the National Health Survey, refers to the group of members of the household related to the head.

The population and the cases of disability occurring in this population were, for reasons of tabulation, actually classified by size of family. But differences resulting from classifying by size of family instead of by size of household were negligible, especially in view of the types of households excluded from this portion of the study. (See p. 612.)

[8] Households with eight or more members in which the number of persons exceeded the number of rooms by one have been classified in the group with one or less persons per room.

[9] For the purposes of this paper, all persons living in a household were classified according to the total income of related members for the 12 months preceding the interview, except that persons in households where relief had been received were classified simply under "Relief." Again reference is made to definitions given in the paper cited in footnote 2.

factors in addition to persons per room would have to be taken into consideration. Among other factors involved, for instance, are size of rooms, size of the household, and the age and sex composition of its membership. It might also be pointed out here, since crowding is being used as an index of the quality of housing generally, that there are a multitude of families who, while not living in congested quarters, are badly housed because of inadequate toilet facilities, dilapidation, dampness, lack of heat, and so on.[10]

For reasons of tabulation, the data are confined to persons in households consisting of at least the household head and his wife. The white population in households containing both the head and his wife was approximately 1,841,000.[11] The suggestion is made that since the home living space required by a household depends in large measure on its composition, by making this exclusion the more or less usual types of families are being studied.

A further exclusion has been made in the consideration of all illnesses combined; persons for whom a confinement or illness associated with pregnancy or childbirth was recorded were excluded from the population base, and all types of cases for such persons were also excluded. Since the crowding index was calculated as of the day of the visit this type of exclusion was desirable to eliminate the effect of a change in the crowding status of these persons by reason of the birth itself. Appendix table 2, where the number of persons affected is given by economic status and degree of crowding, shows that there were 31,263 such persons.

Age composition and household-size composition varied so much from one degree-of-crowding category to another [12] that it is virtually

[10] The fundamental requirements of a healthful home environment are set forth in. Basic principles of healthful housing. Committee on the Hygiene of Housing. American Public Health Association, May 1939 (second edition).

[11] The total white population canvassed was 2,249,995. Thus, 18 percent were excluded because not in households containing both the head and his wife. The difference between the figure, 1,841,000, and the population base, 1,769,993, shown in appendix table 1, is due to the further exclusion of persons about whom age, economic status, education of the wife of the head (excluded for reasons of tabulation), or rooms in the dwelling unit was not known.

[12] By age, the percentage distribution of the white population within each degree-of-crowding category was as follows:

Age in years	*Category A*	*Category B*	*Category C*
Under 15	21.6	39.8	46.3
15–24	16.0	20.6	19.3
25–64	57.0	38.0	33.1
65 and over	5.4	1.7	1.2
	100.0	100.0	100.0

The large proportion of children in the more crowded households is of special note.

By size of household, the percentage distribution of the same population was:

Size of household	*Category A*	*Category B*	*Category C*
2–3 persons	43.6	6.9	7.0
4–5 persons	43.5	30.2	24.7
6–7 persons	10.3	46.0	22.1
8 or more persons	2.6	16.9	46.1
	100.0	100.0	100.0

Clearly, the larger households tend to be the more crowded ones.

a necessity to present, in this section and the next, rates for specific age groups which have been adjusted to a standard household-size composition and rates for all ages which have been adjusted to a standard age and household-size composition. Adjustment to a standard age composition requires no explanation. As for household-size adjustment, it was observed from the data that as size of household increased the illness rate decreased. For all incomes, the percentage of persons disabled a week or longer in a 12-month period decreased from 13.6 in households of two or three persons to 11.7 in households of eight persons or more; for the relief group, the percentage fell from 21.6 to 15.2; for the nonrelief group with income under $1,000, from 14.6 to 11.8. Since less complete reporting of illness in the large households appeared to be the chief explanation for this phenomen, it was found desirable to adjust to a standard household-size distribution.[13]

Table 1 demonstrates the effect of such adjustment. The table presents, for the three degree-of-crowding categories, the percentage of persons disabled for a week or longer during the 12 months immediately preceding the enumerator's visit,[14] (1) unadjusted, (2) adjusted to the age distribution of the white population on which the data are based, and (3) adjusted to the age and household-size distribution of the same population. The excess of the percentage in category *C* over that in category *A* is decreased upon adjustment to a standard age distribution but is increased upon adjustment to a standard age and household-size composition.

The percentages are shown also by age in table 1, unadjusted and adjusted to the household-size composition of this population. For each age group, adjustment results in a greater excess of the percentage in category *C* over that in category *A*.

Economic status.—An extremely important fact to be noted from table 1 is that illness rates go up as degree of crowding increases, the ratio of the adjusted rate for category *C* to that for category *A* being 118.[15] Prima facie, there is an association between illness and crowd-

[13] The population used in the adjustment procedure was as follows

Age in years	Number of persons in household				
	2 or more	2-3	4-5	6-7	8 or more
All ages	1,769,993	609,312	702,782	305,219	152,680
Under 15	472,481	68,198	220,043	116,672	67,568
15-24	301,594	77,751	118,585	66,133	39,125
25-64	917,686	417,021	342,352	114,762	43,551
65 and over	78,232	46,342	21,802	7,652	2,436

[14] Based on persons in the household at the time of the canvass. Persons who were in institutions during the entire 12 months preceding the visit or who died during this period have been excluded from this section on illness and crowding.

[15] For two or more persons per room the percentage of persons disabled was 16.1 (adjusted to the standard age and household-size composition), the ratio of this percentage to that for category *A* being 122.

TABLE 1.—*Effect of adjustment; percentage of persons*[1] *disabled for a week or longer during 1 year, according to age and persons per room*

Age period in years and nature of percentages	Degree of crowding						
	A. 1 person or less per room	*B*. More than 1 person per room, but not more than 1.5	*C*. More than 1.5 persons per room	All households	*A*. 1 person or less per room	*B*. More than 1 person per room, but not more than 1.5	*C*. More than 1.5 persons per room
	Percentage disabled				Ratio of rates in *B* and *C* to *A* (*A*=100)		
All ages:							
Percentages unadjusted	13.3	13.7	14.7	13.5	100	103	111
Percentages adjusted for age	13.6	13.2	14.3	13.5	100	97	105
Percentages adjusted for age and size of household	13.2	13.9	15.6	13.5	100	105	118
Under 15:							
Percentages unadjusted	19.6	18.1	17.2	18.9	100	92	88
Percentages adjusted for size of household	19.2	18.7	18.4	19.3	100	97	96
15–24:							
Percentages unadjusted	8.8	8.2	9.2	8.7	100	93	105
Percentages adjusted for size of household	8.7	9.4	11.6	9.0	100	108	133
25–64:							
Percentages unadjusted	11.3	11.5	13.7	11.5	100	102	121
Percentages adjusted for size of household	10.8	11.9	14.3	11.3	100	110	132
65 and over:							
Percentages unadjusted	21.3	21.0	23.7	21.3	100	99	111
Percentages adjusted for size of household	20.1	22.2	25.5	20.5	100	110	127

[1] Data based on 1,769,993 white persons in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife.
Persons with a confinement or complication of pregnancy or childbirth have been excluded.

ing. Since part of the association can be ascribed to economic factors, table 2 and figure 1 have been prepared to show the situation in households more or less on the same economic level but differing in degree of crowding. In the relief group and the group with annual family income under $1,000, an increase in the degree of crowding was accompanied by an increase in the percentage of persons disabled for a week or longer over a 12-month period. It is of note that, in general, the relative increase in this percentage with greater crowding varied inversely with income. (For the purpose of this discussion, the relief group has been taken to be the lowest income group.) At the $1,000 to $1,500 level the ratio of the rate in category *C* to that in *A* was 98, for households with income below $1,000 it was 104, for the relief group, 113.

That the ratios of the rates in category *C* to those in category *A* were lower for the specific income groups than for the population as a whole is explained by the interaction of two factors: (1) The higher illness rates in the low-income brackets, and (2) the greater concentration of these low-income groups in the categories of increased crowding.

Data for that portion of the population above the $1,500 income level are hereafter omitted because the value of the index, persons per

room, as a measure of poor housing among higher income groups [16] is seriously doubted.

Age.—In table 2 is also shown the percentage of persons disabled annually for a week or longer in each of four broad age groups. For all incomes combined, the percentage of persons thus disabled rose with increase in degree of crowding (in all but the earliest age period). Rates for the oldest group fluctuated with crowding, going up with increase in crowding in some income classes, coming down with such increase in others. These irregular tendencies may have been due in

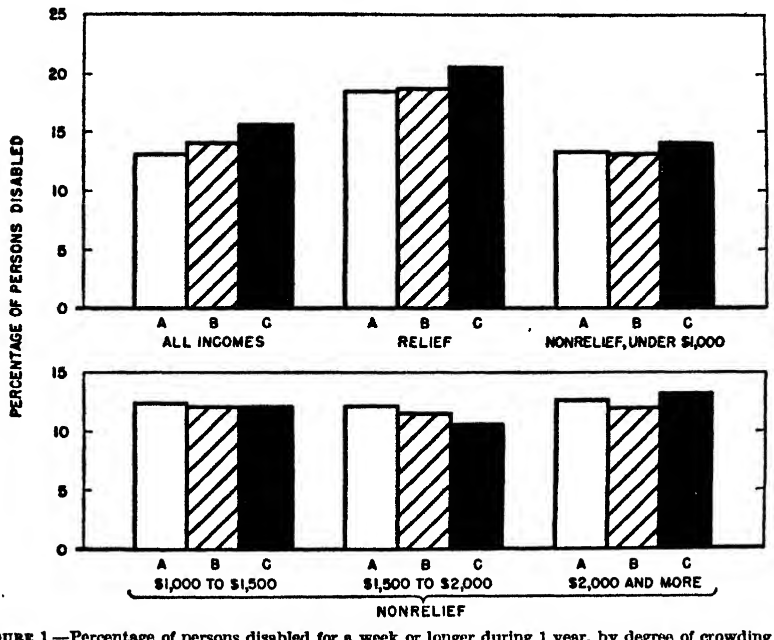

FIGURE 1.—Percentage of persons disabled for a week or longer during 1 year, by degree of crowding and economic status. (Adjusted to a standard age and household-size composition.)

part to the small number of persons constituting this age group in the more crowded categories. (See appendix table 1.) Somewhat more stable were the differences in illness rate with crowding for persons between the ages of 25 and 65. In each of the three lowest income groups the ratio of the rate in category *C* to that in category *A* was

[16] Comparisons of illness rates by economic status may be found in several previous papers presenting National Health Survey data:

Britten, R. H., Collins, S. D., and Fitzgerald, J. S.: The National Health Survey: Some general findings as to disease, accidents, and impairments in urban areas. Pub. Health Rep., 55: 444-470 (1940).

Illness and medical care in relation to economic status. National Health Survey, Preliminary Reports, Sickness and Medical Care Series, Bulletin No. 2, Division of Public Health Methods, National Institute of Health, U. S. Public Health Service, Washington, 1938.

Disability from specific causes in relation to economic status. National Health Survey, Preliminary Reports, Sickness and Medical Care Series, Bulletin No. 9, Division of Public Health Methods, National Institute of Health, U. S. Public Health Service, Washington, 1938.

Perrott, G. St. J., and Holland, Dorothy F.: Health as an element in social security. Annals of the American Academy of Political and Social Science, 202: 116-136 (1939).

TABLE 2.—*Percentage of persons*[1] *disabled for a week or longer during 1 year, according to economic status, age, and persons per room*

Annual family income and relief status, and age in years	Degree of crowding						
	A. 1 person or less per room	*B*. More than 1 person per room, but not more than 1.5	*C*. More than 1.5 persons per room	All house-holds	*A*. 1 person or less per room	*B*. More than 1 person per room but not more than 1.5	*C*. More than 1.5 persons per room
	Percentage disabled[2]				Ratio of rates in *B* and *C* to *A* (*A*=100)		
Relief—all ages	18.3	18.4	20.6	18.8	100	101	113
Under 15	21.7	21.9	22.5	22.1	100	101	104
15–24	11.8	12.1	13.9	12.2	100	103	118
25–64	17.4	17.4	20.5	18.0	100	100	118
65 and over	28.5	28.3	30.6	29.2	100	99	107
Nonrelief							
Under $1,000—all ages	13.4	13.3	14.0	13.5	100	99	104
Under 15	17.8	17.6	15.3	17.9	100	99	86
15–24	8.9	10.0	11.1	9.2	100	112	125
25–64	11.8	11.5	12.4	11.9	100	97	105
65 and over	21.1	22.0	28.0	21.9	100	104	133
$1,000 to $1,500—all ages	12.2	11.9	11.9	12.3	100	98	98
Under 15	18.2	17.3	16.5	18.1	100	95	91
15–24	8.2	7.2	9.7	8.2	100	88	118
25–64	10.0	9.6	10.3	10.1	100	96	103
65 and over	19.5	21.1	14.2	19.5	100	108	73
$1,500 to $2,000—all ages	12.0	11.4	10.6	12.0	100	95	88
Under 15	18.7	16.9	13.6	18.4	100	90	73
15–24	8.3	7.7	9.2	8.3	100	93	111
25–64	9.4	9.2	9.1	9.6	100	98	97
65 and over	17.4	16.7	13.4	17.2	100	96	77
$2,000 and over—all ages	12.7	11.8	12.9	12.7	100	93	102
Under 15	20.8	18.8	20.1	20.7	100	90	97
15–24	8.3	7.4	9.5	8.2	100	89	114
25–64	9.8	8.6	10.1	9.8	100	88	103
65 and over	16.9	20.5	17.2	17.0	100	121	102
All incomes—all ages	13.2	13.9	15.6	13.5	100	105	118
Under 15	19.2	18.7	18.4	19.3	100	97	96
15–24	8.7	9.4	11.6	9.0	100	108	133
25–64	10.8	11.9	14.3	11.3	100	110	132
65 and over	20.1	22.2	25.5	20.5	100	110	127

[1] Data based on 1,769,993 white persons in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife. Persons with a confinement or complication of pregnancy or childbirth have been excluded.

[2] Rates for age groups adjusted to a standard household-size composition and, for all ages, to a standard age and household-size composition.

over 100 (118 for the relief group). But most closely associated with crowding were the illness rates for the youth group. For those in relief households, the ratio of the rate in category *C* to that in *A* was a little below 120; for those in nonrelief households with income below $1,000, the ratio was somewhat above this figure.[17]

[17] Table 1 shows that before adjustment to a standard household-size composition the differences by degree of crowding in this age group were not nearly so great. Two factors combine to account for this difference between the adjusted and unadjusted figures. First, 76 percent of this age group in category *C* were in households of six or more persons, while in category *A* only 20 percent of this age group were found in such large households. Second, the illness rate for this age group dropped sharply with increase in size of household. For all incomes, the unadjusted rate decreased from 10.4 percent for youths in households of 2 to 3 persons to 7.4 percent for youths in households of 8 or more persons. Since the large households were proportionately so numerous in category *C*, the effect of their rates was to lower the rate for the category as a whole.

At all income levels except the lowest (relief), the percentage disabled in the age group under 15 years decreased as the degree of crowding increased, the net result for all incomes combined being a slightly lower rate for categories *B* and *C* than for *A*. With reference to this point, it will be shown later in this article (1) that when seven communicable diseases common among children were examined—and communicable disease plays an important role in the illnesses of childhood—all but one showed an increase in frequency among children under 5 years of age with greater crowding; (2) that the frequency of pneumonia and tuberculosis disabling for a week or longer showed most striking excesses in the age group under 15 with increased crowding; (3) that disability among children on the day of the interview was more prevalent in the more crowded homes; and (4) that among children, home accidents serious enough to disable for at least a week occurred more often where rental or value of the dwelling was low.

Figure 2 summarizes some of the data on age given in table 2. The rates by age and degree of crowding for the three lowest income groups are shown.

Prevalence.—The proportion of persons disabled on the day of the visit offers another measure for evaluating the relationship between illness and housing. Since the number of illnesses recorded on the day of the visit was heavily weighted by cases chronic in nature, the rate has been broken down into (1) percentage of persons who were disabled on the day of visit and who were not reported as having a chronic disease or impairment [18] (table 3); (2) percentage of persons who were disabled on day of visit and who were reported as having a chronic disease or impairment (table 4). About half of those in this latter group had been disabled for the entire 12 months immediately preceding the visit.

Elimination of chronic cases from the total picture leaves rates which showed on the whole, for each of the income classes and age periods, a marked excess in the rate in category *C* over that in category *A* (table 3). Perhaps the most distinctive feature of the table is the rise in rate among children under 15 years with increased crowding, the relief group, for instance, showing a ratio of the rate in category *C* to that in category *A* of 135. Furthermore, the rate (due mostly to colds) was much higher in this age group as a whole than in any other.

It is to be observed from table 4 that little or no relation existed at specific income levels between crowding and the proportion of persons who were disabled on the day of the visit and who were reported as having a chronic disease or impairment. Only the specific age groups

[18] Diseases the symptoms of which were stated to have been present for 3 months or longer, whether disabling or not, have been classified as chronic.

Impairments included are orthopedic impairments (loss of members or presence of crippled or paralyzed members), blindness (in one or both eyes), and deafness.

within the relief group showed any consistent increase in prevalence rate with increase in crowding.[19]

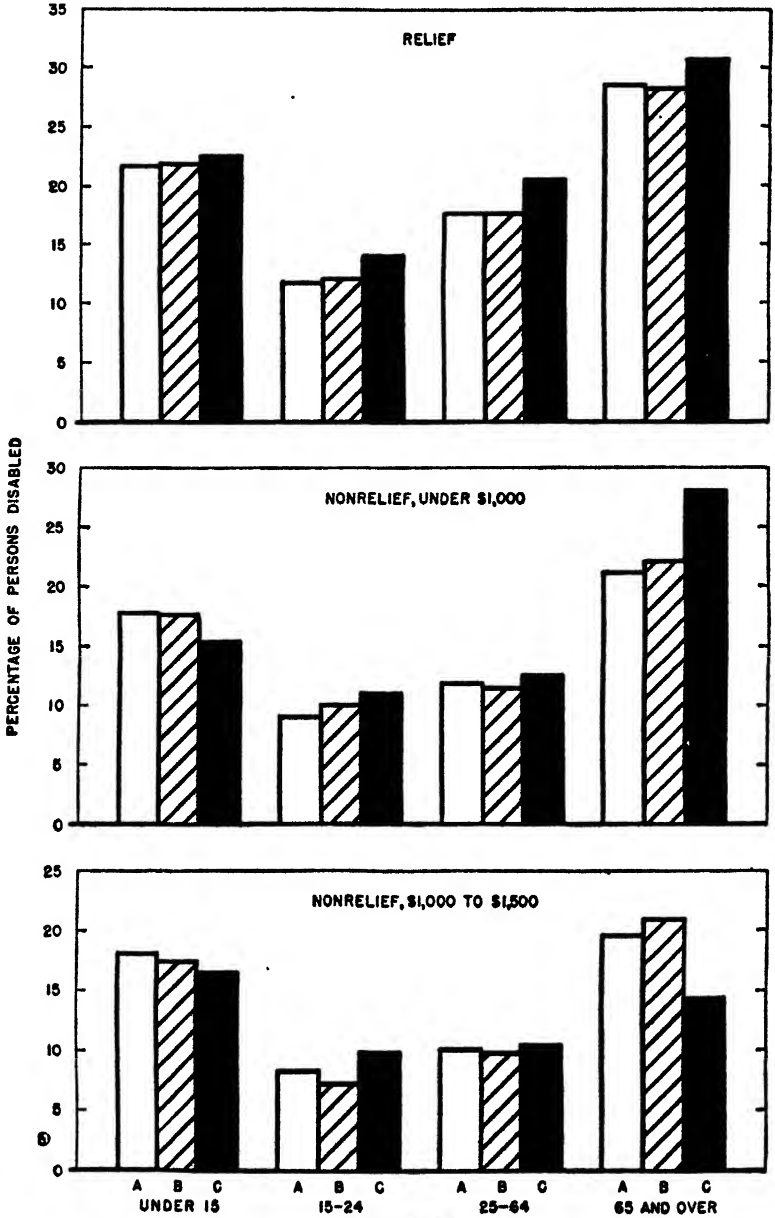

FIGURE 2.—Percentage of persons with an illness disabling for a week or longer during 1 year, by degree of crowding, age, and economic status. (Adjusted to a standard household-size composition.)

[19] That the ratio of the prevalence rate in category *C* to that in *A* was so much higher for all incomes combined than for any of the specific income groups is explainable, as in the case of illness incidence (table 2), by the fact that the higher income groups, with their lower rates, were concentrated in category *A* while category *C* was composed largely of low-income persons with higher rates.

TABLE 3.—*Percentage of persons*[1] *disabled on day of visit and who were not reported as having a chronic disease or impairment, according to economic status, age, and persons per room*

Annual family income and relief status, and age in years	Degree of crowding						
	A. 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room	All households	*A.* 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room
	Percentage disabled[2]				Ratio of rates in *B* and *C* to *A* (*A*=100)		
Relief—all ages	1.99	2.01	2.31	2.07	100	101	116
Under 15	3.38	3.70	4.55	3.62	100	109	135
15-24	1.51	1.09	1.56	1.45	100	72	103
25-64	1.57	1.49	1.72	1.59	100	95	110
65 and over	1.76	1.89	----------	1.88	100	107	----------
Nonrelief							
Under $1,000—all ages	1.59	1.63	1.89	1.60	100	103	119
Under 15	2.80	2.93	3.17	2.95	100	105	113
15-24	1.21	1.09	1.22	1.19	100	90	101
25-64	1.18	1.25	1.36	1.29	100	106	115
$1,000 to $1,500—all ages	1.48	1.64	2.15	1.59	100	111	145
Under 15	2.77	3.01	4.67	2.89	100	109	169
15-24	1.09	1.21	1.86	1.15	100	111	171
25-64	1.04	1.05	1.46	1.10	100	101	140
65 and over	1.53	2.64	----------	1.57	100	173	----------
All incomes[3]—all ages	1.66	1.69	2.06	1.72	100	102	124
Under 15	3.00	3.17	3.89	3.12	100	106	130
15-24	1.19	1.07	1.48	1.20	100	90	124
25-64	1.21	1.21	1.50	1.25	100	100	124
65 and over	1.65	1.78	2.52	1.70	100	108	153

[1] Data based on 1,769,993 white persons in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife. Persons with a confinement or complication of pregnancy or childbirth have been excluded.
[2] Rates for age groups adjusted to a standard household-size composition and, for all ages, to a standard age and household-size composition. Rates are not shown where there were fewer than 20 cases enumerated. Where rates in both categories *B* and *C* would not be shown under this rule, the entire line has been omitted.
[3] Includes persons with income of $1,500 or more.

The above facts—marked relation between crowding and acute illness, and virtually no relation between crowding and chronic illness (at specific income levels)—may be the closest approach thus far in this paper to an evaluation of the inherent association between bad housing and poor health. As a general rule, loss of wages because of an acute illness present on the day of the visit would not have been a factor causing the family to live in congested quarters. That some of the excess in rate among persons in crowded households was due to bad housing would seem a reasonable conclusion.

III. SELECTED DIAGNOSES AND CROWDING

This section deals with an examination of the data on certain diseases that might be expected to show some relation to housing; namely, pneumonia, influenza, tuberculosis, rheumatism, and seven of the more common communicable diseases of childhood. The tables in this section have been prepared in a manner similar to those in the

TABLE 4.—*Percentage of persons*[1] *disabled on day of visit and who were reported as having a chronic disease or impairment, according to economic status, age, and persons per room*

Annual family income and relief status, and age in years	Degree of crowding						
	A. 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room	All households	*A.* 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room
	Percentage disabled[2]				Ratio of rates in *B* and *C* to *A* (*A*=100)		
Relief—all ages	4.82	4.32	5.08	4.84	100	90	105
Under 15	1.10	1.10	1.28	1.14	100	100	116
15–24	1.87	2.04	2.00	1.95	100	109	112
25–64	6.23	5.39	6.38	6.19	100	87	102
65 and over	18.06	19.69	18.97	18.92	100	109	105
Nonrelief:							
Under $1,000—all ages	2.72	2.53	2.65	2.69	100	93	97
Under 15	.77	.69	.67	.77	100	90	87
15–24	1.06	1.20	1.13	1.09	100	113	107
25–64	3.40	2.85	2.92	3.30	100	84	86
65 and over	12.03	13.73	17.02	12.55	100	114	141
$1,000 to $1,500—all ages	1.84	1.66	1.46	1.84	100	90	79
Under 15	.72	.61	.33	.72	100	85	46
15–24	.83	.64	.67	.84	100	77	81
25–64	2.10	1.71	1.72	2.08	100	81	82
65 and over	10.73	12.32	7.97	10.61	100	115	74
All incomes[3]—all ages	2.17	2.56	3.07	2.27	100	118	141
Under 15	.78	.80	.91	.81	100	103	117
15–24	.93	1.16	1.32	1.00	100	125	142
25–64	2.52	2.88	3.66	2.70	100	114	145
65 and over	10.86	14.27	15.47	11.28	100	131	142

[1] Data based on 1,769,993 white persons in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife.
[2] Rates for age groups adjusted to a standard household-size composition, and, for all ages, to a standard age and household-size composition.
[3] Includes persons with income of $1,500 or more.

preceding section; that is, to show illness rates[20] at different levels of crowding, classified by economic status and age; and to show also (except for table 10) the ratios of the rates in categories *B* and *C* to those in *A*, with the rates in category *A* expressed as 100.

Pneumonia.[21]—As may be observed from table 5, there was a marked increase in the frequency of pneumonia with increase in degree of crowding, particularly within the relief group and the marginal self-supporting group (nonrelief, under $1,000). For the former, the pneumonia rate was about 60 percent higher in category *C* than in category *A*; for the latter, it was 45 percent higher. This rise in the rate, especially among children, of an acute disease which so often terminates fatally, may be at least partially accounted for by bad housing. The spread of the disease through contact infection (and

[20] The illness rate used in the remainder of this paper is the frequency of illness per 1,000 persons. Institutionalized cases and cases ending in death are included.

[21] All forms; sole or primary diagnoses only. (The primary diagnosis is that which had been associated with the disability for the longest period; or, if a separate period of disability was not specified for any diagnosis, the primary diagnosis is the one which was regarded by the family as the most important cause of the disability.)

overcrowding), the viability of the pneumococcus in dried sputum and in dust, the debilitation and breakdown of human resistance brought about by exposure to cold in ill-heated, ill-ventilated habitations are all regarded as conducive factors.

Table 5.—*Frequency of pneumonia*[1] *disabling for a week or longer during 1 year, according to economic status, age, and persons per room*[2]

Annual family income and relief status, and age in years	Degree of crowding: *A.* 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room	All households	*A.* 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room
	Frequency per 1,000 persons[3]				Ratio of rates in *B* and *C* to *A* ($A=100$)		
Relief—all ages	6.06	8.32	9.73	6.89	100	137	161
Under 15	11.20	13.56	19.79	12.72	100	121	177
15–24	3.21	4.28	3.35	3.48	100	133	104
25–64	4.48	6.71	7.89	5.35	100	150	176
Nonrelief:							
Under $1,000—all ages	4.07	5.47	5.92	4.47	100	134	145
Under 15	8.03	10.39	11.83	8.82	100	129	147
15–24	1.96	2.93	------	2.19	100	149	------
25–64	2.80	3.88	4.13	3.07	100	139	148
$1,000 to $1,500—all ages	3.76	4.26	4.35	3.98	100	113	116
Under 15	7.06	7.60	7.32	7.40	100	108	104
15–24	1.82	1.85	1.57	1.90	100	102	86
25–64	2.50	2.93	3.75	2.75	100	113	145
All incomes[4]—all ages	4.01	5.39	6.72	4.47	100	134	168
Under 15	7.54	10.18	14.16	8.42	100	135	188
15–24	2.07	2.90	3.02	2.25	100	140	146
25–64	2.82	3.99	5.20	3.15	100	141	184
65 and over	7.64	8.92	------	7.67	100	117	------

[1] Sole or primary diagnoses.
[2] Data based on 1,769,993 white persons in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife.
[3] Rates for age groups adjusted to a standard household-size composition and, for all ages, to a standard age and household-size composition. Rates are not shown where there were fewer than 20 cases enumerated. Where rates in both categories *B* and *C* would not be shown under this rule, the entire line has been omitted.
[4] Includes persons with income of $1,500 or more.

Influenza.[22]—The association between overcrowding and the frequency of influenza may be seen in table 6. The relief group showed an increase of 19 percent in frequency as the degree of crowding increased from one person or less per room to more than one and a half persons per room (from category *A* to category *C*); the group reporting incomes of less than $1,000 showed a slightly greater increase (22 percent).

There was a marked association between degree of crowding and the frequency of influenza among persons between the ages of 25 and 65. For the portion of this age group on relief, the frequency was almost a third greater in category *C* than in *A*; in the next higher

[22] Influenza and grippe; sole or primary diagnoses only. Included are disabling ailments reported as intestinal influenza or grippe, influenza or grippe accompanied by sore throat, laryngitis, bronchitis, or tonsillitis.

income group, the frequency was a fourth greater. Since influenza usually runs a brief, acute course, loss of earnings because of this disease would not in general operate as a selective factor to force households to move into more crowded dwellings.

TABLE 6.—*Frequency of influenza* [1] *disabling for a week or longer during 1 year, according to economic status, age, and persons per room* [2]

Annual family income and relief status, and age in years	Degree of crowding						
	A. 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room	All households	*A.* 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room
	Frequency per 1,000 persons [3]				Ratio of rates in *B* and *C* to *A* (*A*=100)		
Relief—all ages	19.4	20.1	23.1	20.5	100	104	119
Under 15	16.9	18.1	14.9	17.8	100	107	88
15–24	17.5	16.0	18.4	17.6	100	91	105
25–64	20.4	21.6	26.4	22.0	100	106	129
65 and over	27.1	22.8		26.2	100	84	
Nonrelief:							
Under $1,000—all ages	15.6	16.4	19.1	16.5	100	105	122
Under 15	14.6	16.9	14.8	15.7	100	116	101
15–24	14.2	13.7	17.0	14.6	100	96	120
25–64	16.0	16.9	20.0	17.0	100	106	125
65 and over	22.0	21.5		22.0	100	98	
$1,000 to $1,500—all ages	15.5	14.8	13.6	15.2	100	95	88
Under 15	15.7	14.9	9.9	15.2	100	95	63
15–24	13.0	12.0	13.4	12.7	100	92	103
25–64	15.9	15.4	15.0	15.8	100	97	94
65 and over	21.8	22.6		20.1	100	104	
All incomes [4]—all ages	17.4	16.5	18.8	17.5	100	95	108
Under 15	18.9	16.5	14.6	18.4	100	87	77
15–24	14.6	13.1	15.9	14.5	100	90	109
25–64	17.3	17.3	20.6	17.7	100	100	119
65 and over	20.6	18.9	28.9	20.4	100	92	140

[1] Sole or primary diagnoses.

[2] Data based on 1,769,993 white persons in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife.

[3] Rates for age groups adjusted to a standard household-size composition and, for all ages, to a standard age and household-size composition. Rates are not shown where there were fewer than 20 cases enumerated

[4] Includes persons with income of $1,500 or more.

Tuberculosis.[23]—"Certainly crowding must facilitate the spread of infection in families where open cases exist, but it is usually so inextricably tied up with low wages, and the resulting inadequate nutrition, fatigue, and other conditions favorable to the spread of disease that the effects of overcrowding in itself are hard to measure." [24] Because of these conditions, and because of the chronic nature of the disease and the frequent removal to institutions of active cases,[25] no

[23] All forms; sole or primary diagnoses only.

[24] Rosenau, Milton J.: Preventive Medicine and Hygiene. 6th edition. D. Appleton-Century Co., 1935, p. 52.

[25] Persons in institutions for the care of physical or mental diseases were not directly enumerated in the National Health Survey, but the family was asked to report with regard to any such persons who had formerly lived in the household. The record obtained was incomplete; hence, the cases of tuberculosis on which the rates in table 7 are based are largely those still in the home.

very clear picture of the association between congestion in the home and the prevalence of this disease is possible from the data of the National Health Survey.

Table 7, however, does show that there was a considerable increase in the frequency of tuberculosis with increase in crowding, both for the relief group and for all incomes combined. Greatest association with crowding was found for the illness rates in the youngest age group, with a ratio of the rate in category *C* in the relief group to that in *A* of 260, a ratio much higher than that shown by the 25–64-year age group (158) or the group between 15 and 25 years of age (131).[26]

TABLE 7.—*Frequency of tuberculosis*[1] *disabling for a week or longer during 1 year, among persons under 65 years, according to economic status, age, and persons per room*[2]

Annual family income and relief status, and age in years	Degree of crowding						
	A. 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room	All households	*A.* 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C.* More than 1.5 persons per room
	Frequency per 1,000 persons[3]				Ratio of rates in *B* and *C* to *A* (*A*=100)		
Relief—all ages under 65	2.83	2.64	4.50	2.92	100	93	159
Under 15	.91	.73	2.44	.97	100	78	260
15–24	2.55	2.32	3.34	2.55	100	91	131
25–64	3.74	3.58	5.90	3.94	100	96	158
Nonrelief:							
Under $1,000:							
All ages under 65	1.22	1.29	.91	1.27	100	106	75
25–64	1.45	1.91	----------	1.60	100	132	----------
$1,000 to $1,500							
All ages under 65	.88	.70	1.08	.85	100	80	123
25–64	1.14	.91	----------	1.09	100	80	----------
All incomes[4]—all ages under 65	1.02	1.24	1.95	1.10	100	122	191
Under 15	.40	.33	1.08	.42	100	83	270
15–24	1.34	1.10	1.44	1.34	100	82	107
25–64	1.24	1.69	2.68	1.41	100	136	216

[1] Sole or primary diagnoses.

[2] Data based on 1,691,761 persons under 65 years of age in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife.

[3] Rates for age groups adjusted to a standard household-size composition and, for 3 age groups combined, to a standard age and household-size composition. Rates are not shown where there were fewer than 20 cases enumerated. Where rates in both categories *B* and *C* would not be shown under this rule, the entire line has been omitted.

[4] Includes persons with income of $1,500 or more.

Rheumatism.[27]—Though chronic in nature, rheumatism suggests some connection with bad housing, since dampness and cold are considered to be important predisposing factors. Whatever the pre-

[26] Rates classified by age have been largely omitted from table 7 for the reason that above the relief level there were not more than 11 cases tabulated in category *C* for any age period. The oldest age group, 65 years and over, has been omitted entirely since there were only 4 cases enumerated in category *B* and 4 cases in category *C*.

[27] Sole or primary diagnoses only. Under the head of rheumatism are included also arthritis, gout, neuralgia, neuritis, lumbago, stiff neck, and other muscular pains.

cise causal relations, that greater frequency of rheumatism and greater crowding were found together is of significance in the hygiene of housing (table 8). Table 8 also gives the frequency of rheumatism and allied diseases (among persons 25 years of age or over) according to three age periods.[28] All three periods demonstrated much the same association between rheumatism and crowding, category *C* showing a consistent excess over category *A* in frequency of disabling rheumatism (except in the $1,000 to $1,500 income group).

TABLE 8.—*Frequency of rheumatism* [1] *disabling for a week or longer during 1 year, among persons aged 25 or more, according to economic status, age, and persons per room* [2]

Annual family income and relief status, and age in years	Degree of crowding						
	A. 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C* More than 1.5 persons per room	All households	*A.* 1 person or less per room	*B.* More than 1 person per room, but not more than 1.5	*C* More than 1.5 persons per room
	Frequency per 1,000 person [3]				Ratio of rates in *B* and *C* to *A* (*A*=100)		
Relief—25 and over	14.6	14.2	16.9	15.2	100	97	116
25–44	9.4	9.4	9.9	9.8	100	100	105
45–64	19.8	18.4	22.8	20.7	100	93	115
65 and over	30.0	31.8	----------	31.6	100	106	----------
Nonrelief.							
Under $1,000—25 and over	9.0	8.2	10.5	9.0	100	91	117
25–44	5.4	5.3	7.3	5.4	100	98	135
45–64	12.1	10.7	12.7	12.4	100	88	105
$1,000 to $1,500—25 and over	7.0	7.0	4.7	6.8	100	100	67
25–44	3.9	3.1	2.9	3.6	100	79	74
45–64	9.6	9.8	8.3	9.5	100	102	86
All incomes [4]—25 and over	7.5	9.0	10.7	7.9	100	120	143
25–44	4.3	5.5	6.5	4.6	100	128	151
45–64	10.2	12.1	14.4	10.7	100	119	141
65 and over	19.7	22.5	24.1	20.0	100	114	122

[1] Includes arthritis, gout, neuralgia, neuritis, lumbago, stiff neck, and other muscular pains; sole or primary diagnoses.
[2] Data based on 995,921 white persons aged 25 or over in 83 cities. The population is comprised of persons in households consisting of at least the household head and his wife.
[3] Rates for age groups adjusted to a standard household-size composition and, for 3 age groups combined, to a standard age and household-size composition. Rates are not shown where there were fewer than 20 cases enumerated. Where rates in both categories *B* and *C* would not be shown under this rule, th entire line has been omitted.
[4] Includes persons with income of $1,500 or more.

Figure 3 summarizes some of the data on the four diagnoses—pneumonia, influenza, tuberculosis, and rheumatism. The figure shows graphically the frequency with which these diseases disabled, for a week or longer, persons in different economic groups and living under different degrees of crowding. It may be observed for each diagnosis that in general the incidence was higher with increased crowding. This rise in illness rate was greatest in the instances of

[28] Rates for childhood and youth would have introduced what was really a separate diagnosis—acute rheumatic fever. Rates have also been omitted for the old-age group above the relief level, since there were fewer than 20 cases enumerated in categories *B* and *C*.

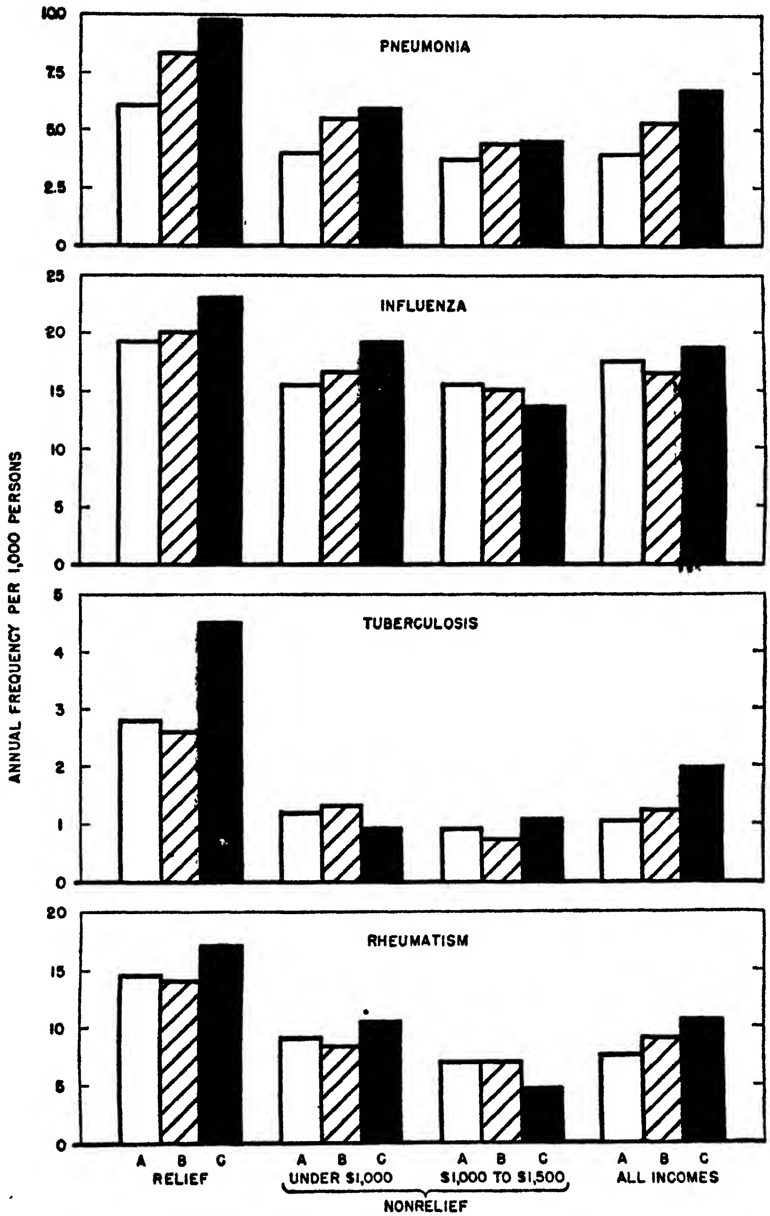

FIGURE 3.—Annual frequency among persons of 4 diagnoses (illnesses disabling for a week or longer), by degree of crowding and economic status. (Adjusted to a standard age and household-size composition.)

pneumonia and tuberculosis; for influenza and rheumatism the rise in rate was marked by its consistency, except for the group with income between $1,000 and $1,500.

Common communicable diseases of childhood.—The diseases included under this head are measles, whooping cough, chickenpox, mumps, scarlet fever, German measles, and diphtheria,[29] all contracted through contact with cases or carriers. Table 9 gives for each of these diseases the incidence rates of cases disabling for a week or longer among children under 5 years and among those between 5 and 10 years of age. Since the incidence of these diseases varied but little with income, comparisons have not been made by economic status.[30] Also, no adjustment to a standard household-size distribution has been made because, on the whole, the illness rates for children under 5 years of age tended to increase with size of household.[31]

TABLE 9.—*Frequency among children* [1] *of certain communicable diseases* [2] *of childhood disabling for a week or longer during 1 year, by age and persons per room*

Diagnosis and age in years	Degree of crowding						
	A. 1 person or less per room	B. More than 1 person per room, but not more than 1.5	C. More than 1.5 persons per room	All households	A. 1 person or less per room	B. More than 1 person per room, but not more than 1.5	C. More than 1.5 persons per room
	Frequency per 1,000 persons				Ratio of rates in B and C to A (A = 100)		
Diphtheria:							
Under 5	0.80	1.42	2.18	1.15	100	178	272
5-9	1.18	1.49	2.21	1.41	100	126	187
Mumps:							
Under 5	8.2	11.5	14.2	9.9	100	140	173
5-9	29.3	27.4	30.4	29.0	100	94	104
Scarlet fever:							
Under 5	5.62	8.65	7.30	6.60	100	154	130
5-9	17.08	16.08	12.28	16.11	100	94	72
German measles:							
Under 5	3.07	3.89	3.98	3.40	100	127	130
5-9	7.58	7.76	5.83	7.36	100	102	77
Chickenpox:							
Under 5	20.4	23.3	23.0	21.4	100	114	113
5-9	37.3	28.0	20.3	32.4	100	75	54
Measles:							
Under 5	36.0	39.7	38.1	37.2	100	110	106
5-9	63.4	52.1	42.6	57.4	100	82	67
Whooping cough:							
Under 5	25.7	23.4	21.3	24.5	100	91	83
5-9	20.1	15.6	12.5	17.8	100	78	62

[1] Data based on 142,957 white children under 5 years and 160,785 white children between the ages of 5 and 10 in 83 cities. The population is comprised of children in households consisting of at least the household head and his wife.
[2] Sole or primary diagnoses.

[29] Sole or primary diagnoses only.
[30] By income, the rate per 1,000 children varied for the seven diagnoses combined as follows:

Age in years	Relief	Nonrelief			
		Under $1,000	$1,000 to $1,500	$1,500 to $2,000	$2,000 and over
Under 5	124	93	100	101	100
5-9	157	149	157	168	180

[31] For the 7 diagnoses combined, the annual frequency rate per 1,000 children varied by size of household as follows: 2-3 persons, 59; 4-5 persons, 116; 6-7 persons, 129; 8 or more persons, 106.

Among children under 5 years (preschool), each of the diseases, with the exception of whooping cough, showed an excess frequency in category *C* as compared with category *A*, although the frequency of scarlet fever, chickenpox, and measles was higher in category *B* than in *C*.

Among children between the ages of 5 and 10, the frequency of these communicable diseases decreased as the degree of crowding increased, with the exception of diphtheria and mumps. For chickenpox, the rate in category *C* was half that in category *A*; for whooping cough, about 60 percent. But this decrease in rate is no paradox. A single attack of one of these diseases will generally give a lasting immunity against it; so that the population at risk becomes increasingly smaller as children grow older, especially in the case of the more prevalent diseases. A higher incidence rate for the early years of life in any particular group is likely to mean a lowered rate later on. The increase in the rate in the age group under 5 and the decrease in the rate in the age group 5–9 with increased crowding suggests that where crowding exists these communicable diseases of childhood *attack at an earlier age*. It is generally recognized that a younger age incidence is accompanied by greater risk of serious complications and of mortality.

Evidence of this younger age incidence where home congestion obtains is presented in table 10, which gives for each of the children's diseases the ratio of the illness rates for children under 5 years to the corresponding rates for children between 5 and 10 years, according to the degree of crowding. For each of the diagnoses, without exception, the ratios increased from category *A* to category *C*. Chickenpox showed the greatest increase, the ratio more than doubling (from 55 to 113); scarlet fever, too, showed a striking increase, the ratio almost doubling (from 33 to 59). In the case of whooping cough, where the frequency of illness for both age groups had declined with increase in degree of crowding (table 9), the ratio increased by a third (from 128 to 170). These data are graphically portrayed in figure 4. The scales have been arranged so as to make the bars for category *A* of uniform length, thereby simplifying comparisons among the several diagnoses.

IV. DIGESTIVE DISEASES AND TOILET FACILITIES [32]

In this section, persons living in households with private inside flush toilets [33] and persons in households not meeting this standard have been compared as to the annual frequency of certain digestive

[32] A detailed description of the characteristics of the Health Survey population with respect to possession of sanitary facilities is to be published.

[33] The toilet facilities of the households enumerated in the National Health Survey were reported as "private" or "communal" and as "flush, inside," "flush, outside," or "privy." The definitions of the classifications in the text may be summarized as follows: Private—toilets customarily used by the members of one household only, i. e., not shared with any other household; inside—toilets located indoors, i. e., within a building; flush—toilets or water closets with flush bowls, i. e., connected with any water supply.

diseases (disabling for a week or longer)—indigestion and other stomach ailments; diarrhea, enteritis, and colitis; typhoid and paratyphoid

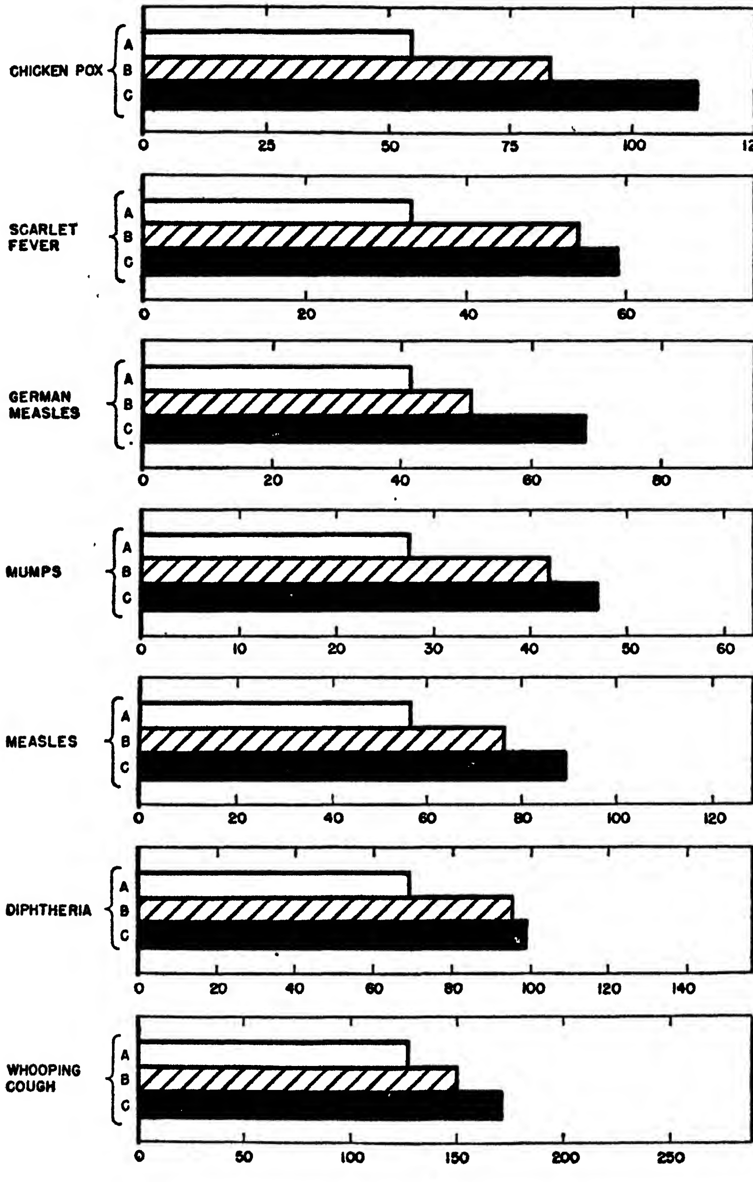

FIGURE 4.—Ratio of annual frequency of 7 communicable diseases of childhood in age group under 5 to that in age group 5–9, by diagnosis and degree of crowding.

fever.[34] As was pointed out in the introductory paper referred to previously (see footnote 3), in households not meeting this standard

[34] Sole, primary, and contributory diagnoses.

there probably were concomitant deficiencies (especially, lack of screening and poor facilities for refrigeration of food) which may have an effect on the illness rate from this group of digestive diseases. Moreover, as in the case of crowding, the index used tends to measure poor housing as a whole.[35]

TABLE 10.—*Ratio of frequency of common communicable diseases of childhood*[1] *disabling for a week or longer during 1 year in age group under 5 to that in age group 5–9*[2] *for each degree-of-crowding group*

(Frequency in age group 5–9=100)

Diagnosis	Degree of crowding		
	A. 1 person or less per room	*B*. More than 1 person per room, but not more than 1.5	*C* More than 1.5 persons per room
Diphtheria	68	95	99
Mumps	28	42	47
Scarlet fever	33	54	59
German measles	41	50	68
Chickenpox	55	83	113
Measles	57	76	89
Whooping cough	128	150	170

[1] Sole or primary diagnoses.
[2] Data based on 142,957 white children under 5 years and 160,785 white children between the ages of 5 and 10 in 83 cities. The population is comprised of children in households consisting of at least the household head and his wife.

In table 11 is shown the frequency, over a 12-month period, of disability (for a week or longer) from these diseases among those who did and those who did not live in households with private inside flush toilets.[36] The rate for the latter group was almost 70 percent in excess of the rate for the former. Typhoid fever, as might be expected,

[35] The following table, based on a 0.5-percent random sample of punched cards, indicates how closely related are overcrowding and the absence of a private inside flush toilet:

Size of city	Percentage of households without a private inside flush toilet, by degree of crowding		
	A. 1 person or less per room	*B*. More than 1 person per room, but not more than 1.5	*C*. More than 1.5 persons per room
100,000 and over	4.2	10.0	22.7
25,000 to 100,000	6.7	13.5	45.0
Under 25,000	12.2	31.6	60.0

In each of the three city-size groups, the percentage of households without a private inside flush toilet rose markedly as degree of crowding increased (the data being shown by city-size group because of differences in frequency of substandard facilities with size of city).

[36] The population base in this section differs somewhat from that in the foregoing sections because of differences in the character of the exclusions made. Excluded here were all persons in single-person households and persons for whom the annual family income or the type of toilet facility used at home was unknown. The population remaining numbered 2,076,641, of whom 172,743 (8.3 percent) did not have private inside flush toilets. (Thus, the exclusions totaled 173,354 persons or 7.7 percent of the entire white population surveyed.)

The rates in this section are not adjusted to a standard age or household-size composition.

showed the greatest excess, about 100 percent. The frequency of indigestion and other stomach ailments was three-fourths higher, and of diarrhea, enteritis, and colitis, two-fifths higher in the group without private inside flush toilets. That the differences between the rates for the two groups were to a certain extent due to differences in economic status is evidenced by the smaller variations within the specific income groups themselves. However, marked divergences still remain at the two lowest income levels. For the three groups of digestive diseases combined, the frequency of disabling illness in the relief group was 37 percent greater among those who did not have private inside flush toilets than among those who did. For the marginal self-supporting group (nonrelief, under $1,000), the excess was almost as great, 35 percent. Although for the group reporting an income between $1,000 and $1,500 the excess dropped to but 4 percent, it may be pointed out that for the group with income of $1,500 or more the excess amounted to 35 percent.

TABLE 11.—*Frequency of certain digestive diseases [1] disabling for a week or longer during 1 year in relation to (a) presence, or (b) absence of a private inside flush toilet, according to economic status [2]*

Annual family income and relief status	Total			Indigestion and other stomach ailments			Diarrhea, enteritis, colitis			Typhoid and paratyphoid fever		
	(a) With	(b) Without	Ratio (b) to (a)	(a) With	(b) Without	Ratio (b) to (a)	(a) With	(b) Without	Ratio (b) to (a)	(a) With	(b) Without	Ratio (b) to (a)
	Disabling illnesses per 1,000 persons and ratio of frequency for those without to those with private inside flush toilets ("with"=100) [3]											
Relief	5.64	7.72	137	4.16	5.68	137	1.27	1.66	131	0.212	0.376	177
Nonrelief:												
Under $1,000	4.39	5.94	135	3.18	4.34	136	1.06	1.34	126	.146	.264	181
$1,000 to $1,500	3.09	3.20	104	2.15	2.38	111	----	----	----	----	----	----
All incomes [4]	3.61	6.08	168	2.52	4.47	177	.96	1.32	138	.127	.289	228

[1] Sole, primary, and contributory diagnoses.
[2] Data based on 2,076,641 white persons in 83 cities. The population is comprised of persons in households of 2 or more related persons. Of the total, 1,903,898 reported a private inside flush toilet, 172,743 some other type.
[3] Rates are omitted where there were fewer than 20 cases enumerated (in the group without a private inside flush toilet).
[4] Includes persons with income of $1,500 or more.

The question arises as to what relation would be shown if comparisons for some other diseases of the digestive system, not thought of as connected with sanitation, were to be made in the same way. This has been done with a miscellaneous group of digestive diseases including constipation, appendicitis, peritonitis, abdominal adhesions, intestinal obstructions, and others. The results (frequency per 1,000 white persons of illness disabling for a week or longer) were as follows:[37]

[37] About 80 percent of the size of these rates was due to appendicitis.

Annual family income and relief status	Private inside flush toilet		Ratio (b) to (a)
	(a) With	(b) Without	
Relief	7.34	7.15	97
Nonrelief:			
Under $1,000	6.26	5.76	92
$1,000 to $1,500	6.37	5.47	86
All incomes	6.81	6.35	93

Persons living in households without a private inside flush toilet did not show a higher frequency of illness from such causes.

There was marked variation among regions and among cities of different sizes in the proportion of persons having the use of private inside flush toilets (see footnote 32). Hence, examination of the group of digestive diseases shown in table 11 is also made by geographic area and size of city (table 12). It may be readily seen from the table, in which, for brevity, only ratios are shown, (1) that in all except one of the area and city-size groups there was an excess in the rate for the group not having such toilet facilities, and (2) that a similar tendency was shown by the two specific income groups used.

V. HOME ACCIDENTS AND RENTAL (OR VALUE) [38]

No direct information as to the physical condition of the canvassed dwellings was recorded on the survey schedule, and some other index had to be adopted which would permit a study of the relation between hazards in the home and the frequency of serious accidents occurring therein. The most logical index was the rent charged for the dwelling (or its value if occupied by its owner); [39] for, on the average, the lower the rental or value of a house or an apartment, the more dilapidated it is likely to be, the darker the rooms, the greater the fire hazard. That these conditions are conducive to a higher accident rate goes almost without saying.

Since the lower the rental, the more crowded the dwelling unit (see footnote 6), it is clear that the index tends to measure, as do the crowding and toilet facility indexes, the whole poor housing environment. From one point of view, however, we are on surer ground than in the illness rate comparisons, since as a general rule current accidents

[38] A detailed description of the characteristics of the Health Survey population with respect to home accidents will be found in: Britten, R. H., Klebba, J., and Hailman, D. E.: Accidents in the urban home as observed in the National Health Survey. Pub. Health Rep., 55: 2061 (1940).

See also: Accidents as a cause of disability. National Health Survey, Preliminary Reports, Sickness and Medical Care Series, Bulletin No. 3, Division of Public Health Methods, National Institute of Health, U. S. Public Health Service, Washington, 1938.

[39] For households renting their living quarters at the time of the visit a record was made of the monthly rental being charged (not necessarily paid) for such quarters at that time; for households owning their living quarters at such time, the record made was that of the family informant's estimate of the value of such quarters.

TABLE 12.—*Digestive diseases disabling for a week or longer during 1 year: relation of frequency among persons with to frequency among persons without a private inside flush toilet, according to geographic area and size of city and economic status*

Geographic area [1] and size of city (by population)	All incomes	Relief	Nonrelief, under $1,000
	Ratio of frequency among those without to frequency among those with private inside flush toilets ("with" = 100)		
All areas—all cities	168	137	135
100,000 and over	143	116	120
25,000–100,000	178	144	131
Under 25,000	164	136	130
Northeast—all cities	136	96	129
100,000 and over	134	105	125
25,000–100,000	211		
Under 25,000	97	59	
North Central—all cities	200	170	152
100,000 and over	160	129	125
25,000–100,000	178	144	137
Under 25,000	222	252	138
South—all cities	158	127	122
100,000 and over	128	99	133
25,000–100,000	162	125	109
Under 25,000	155	114	105
West—all cities	170	144	116
100,000 and over	169	142	
25,000–100,000			
Under 25,000	163	146	

[1] The Health Survey States included in the 4 regions are: Northeast—Massachusetts, New Jersey, New York, Pennsylvania; North Central—Illinois, Michigan, Minnesota, Missouri, Ohio; South—Alabama, Georgia, Louisiana, Texas, Virginia; West—California, Oregon, Utah, Washington.

NOTE.—See footnotes to table 11. Ratios are omitted where (for the group without private inside flush toilets) less than 20 cases were enumerated.

TABLE 13.—*Frequency of home accidents [1] disabling for a week or longer during 1 year, by ownership and type of dwelling, monthly rental or value, and age of occupants [2]*

Ownership and type of dwelling; monthly rental or value	Age in years									
	All ages	Under 15	15–24	25–64	65 and over	All ages	Under 15	15–24	25–64	65 and over
	Disabling home accidents per 1,000 persons					Ratio to rate for persons in dwellings of not less than $30 rental or $3,000 value (expressed as 100)				
Rented multiple dwelling:										
Under $10	5.80	4.47	3.15	5.97	26.54	169	152	182	170	240
$10 to $20	4.85	4.78	2.70	4.79	18.30	141	162	156	136	165
$20 to $30	3.66	3.80	1.69	3.66	17.22	106	129	98	104	156
$30 and over	3.44	2.95	1.73	3.52	11.06	100	100	100	100	100
All rentals	4.17	4.02	2.18	4.14	16.10					
Rented single dwelling:										
Under $10	5.44	4.91	3.53	5.88	13.18	134	119	162	143	119
$10 to $20	5.08	5.13	3.21	5.08	11.85	125	125	147	124	107
$20 to $30	4.35	4.74	2.31	4.03	19.44	107	115	106	98	175
$30 and over	4.07	4.12	2.18	4.11	11.09	100	100	100	100	100
All rentals	4.72	4.84	2.81	4.64	13.29					
Owned dwelling:										
Under $1,000	6.76	5.60	3.75	6.01	20.00	142	147	189	140	130
$1,000 to $2,000	5.78	5.47	3.26	5.17	15.88	122	143	165	120	103
$2,000 to $3,000	5.19	4.76	2.80	4.64	13.33	109	125	141	108	87
$3,000 and over	4.75	3.82	1.98	4.30	15.36	100	100	100	100	100
All values	5.01	4.31	2.31	4.49	15.26					
All dwellings	4.64	4.43	2.42	4.41	14.99					

[1] Sole, primary, and contributory diagnoses.
[2] With minor exclusions, data based on the entire surveyed population, white and colored (2,415,000 persons).

will not of themselves have driven the family into homes for which lower rents are charged.

For purposes of comparison the dwellings surveyed have been divided into "owned" (i. e., owner-occupied) and "rented," and the latter group further subdivided by type of dwelling into "single" and "multiple." [40] As shown in the first column of table 13, each group evidenced a marked rise in rate of accidents disabling for a week or longer with decrease in rental or value of the dwelling.[41] Most outstanding is the 70 percent increase in accident rate with decline in monthly rental from $30 or more to less than $10 for persons living in rented multiple dwellings.

Age of occupants.—Closest association between accidents and dwelling rental or value was in general shown by the youth group (15–24 years). For those of this group in owned homes and in rented multiple dwellings the rate almost doubled as the value reported dropped from $3,000 or more to less than $1,000 and as monthly rental dropped from $30 or more to less than $10; for those in rented single dwellings the excess was over 60 percent. For the other age groups, the excess in accident rate at one rental or value over the next higher rental or value varied from one type of dwelling to another; but chief significance must be attached to the very persistency of these variations in the one direction. As rental or value went down, the accident rate went up. This is portrayed graphically in figure 5, where the rented multiple dwelling was selected as illustrative of the point.[42]

Sex.—Variations by sex are of particular interest in connection with the subject of home accidents because of the sharp differences between the sexes in exposure to the risk of such accidents. The accident rate

[40] A multiple dwelling was one in which the entrance from the street was used in common by more than one household; all other dwellings were classified as single.

[41] The entire surveyed population, white and colored, was used in this section, except for the exclusion of those for whom age or type of rental or value of dwelling was unknown. The population (estimated, for reasons of tabulation, from a 0.5 percent sample of the punched cards) was 2,415,000, 3.6 percent of all those canvassed being excluded.

This population was fairly evenly distributed among the three types of dwellings Rented multiple, 33.1 percent; rented single, 31 6 percent; owned, 35.3 percent. The percentage distribution by rental or value within each type was as follows:

Rental or value	Rented		Owned
	Multiple	Single	
Under $10—Under $1,000	8 6	13.5	3 8
$10 to $20—$1,000 to $2,000	33.1	38.3	11.2
$20 to $30—$2,000 to $3,000	26.6	28.2	15.2
$30 and over—$3,000 and over	31.7	20.0	69.8
	100.0	100.0	100.0

The rates in this section are not adjusted to a standard age or household-size composition.

[42] The data for all ages combined are not reproduced since they agreed so closely with the data plotted for age group 25–64.

for males rose much more rapidly with decline in dwelling rental or value than did the rate for females. For the population in rented

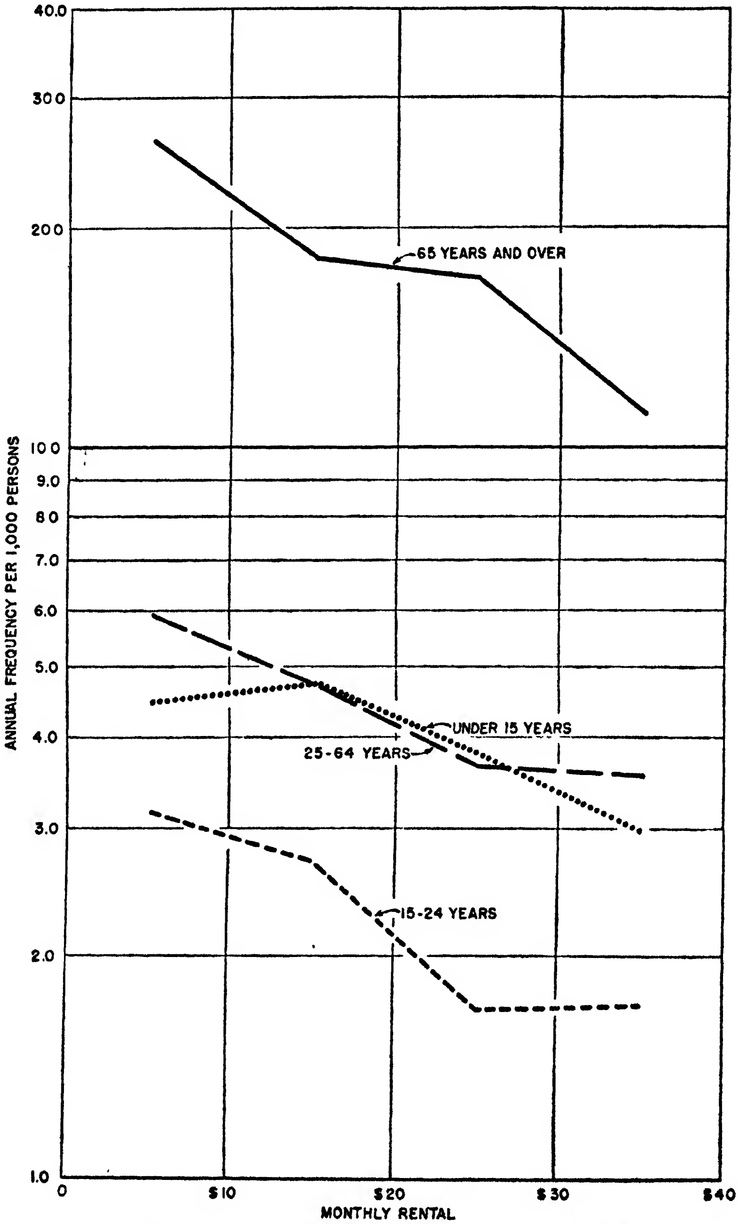

FIGURE 5.—Annual frequency of home accidents disabling for a week or longer, by age and rental. (Households in rented multiple dwellings.)

multiple dwellings the accident rate more than doubled for males as rental fell from $30 or more to $10 or less, while for females in this

group the rate increased about 50 percent. The last column of table 14 shows that there was a tendency for the differences in actual rate between the sexes to increase with increase in rental or value.

Table 14.—*Frequency of home accidents[1] disabling for a week or longer during 1 year, by ownership and type of dwelling, monthly rental or value, and sex of occupants [2]*

Ownership and type of dwelling; monthly rental or value	Sex				Ratio of rate for females to that for males (rate for males expressed as 100)
	Male	Female	Male	Female	
	Disabling home accidents per 1,000 persons		Ratio to rate for persons in dwellings of not less than $30 rental or $3,000 value (expressed as 100)		
Rented multiple dwelling:					
Under $10	4.67	6.88	209	154	147
$10 to $20	3.97	5.74	178	128	145
$20 to $30	3.09	4.18	139	93	135
$30 and over	2.23	4.48	100	100	201
All rentals	3.27	5.00			153
Rented single dwelling:					
Under $10	5.32	5.55	164	114	104
$10 to $20	4.76	5.37	147	111	113
$20 to $30	3.69	5.02	114	104	136
$30 and over	3.24	4.85	100	100	150
All rentals	4.22	5.19			123
Owned dwelling:					
Under $1,000	6.56	6.94	186	119	106
$1,000 to $2,000	4.60	7.09	130	121	154
$2,000 to $3,000	4.21	6.01	119	103	143
$3,000 and over	3.53	5.84	100	100	165
All values	3.88	6.04			156
All dwellings	3.78	5.43			144

[1] Sole, primary, and contributory diagnoses.
[2] With minor exclusions, data based on the entire surveyed population, white and colored (2,415,000 persons; males, 48 percent; females, 52 percent).

Means of injury.—Upon examination of the data classified by means of injury, as presented in table 15 and figure 6, it is not a little surprising to observe that cutting and piercing instruments and burns took relatively greater toll with lower rental or value than did falls. For rented multiple dwellings, for example, the frequency with which serious disability resulted from burns increased fourfold as monthly rental decreased from $30 or more to less than $10; disability caused by cutting and piercing instruments rose 70 percent in the same rental interval, while for falls the percentage increase was about 40. Disability from falls, so far as single dwellings are concerned, showed much less relation to rental or value than the other means of injury, there being an excess of only 19 percent in the accident rate for owned homes and a deficiency of 3 percent for rented single dwellings.

VI. SUMMARY

The National Health Survey, a house-to-house canvass covering some 2,500,000 persons in 83 representative cities, obtained certain data on illness and on housing conditions which has made possible a

study of the association between housing and health. Analysis has been divided into four sections: (1) Illness from all causes and crowd-

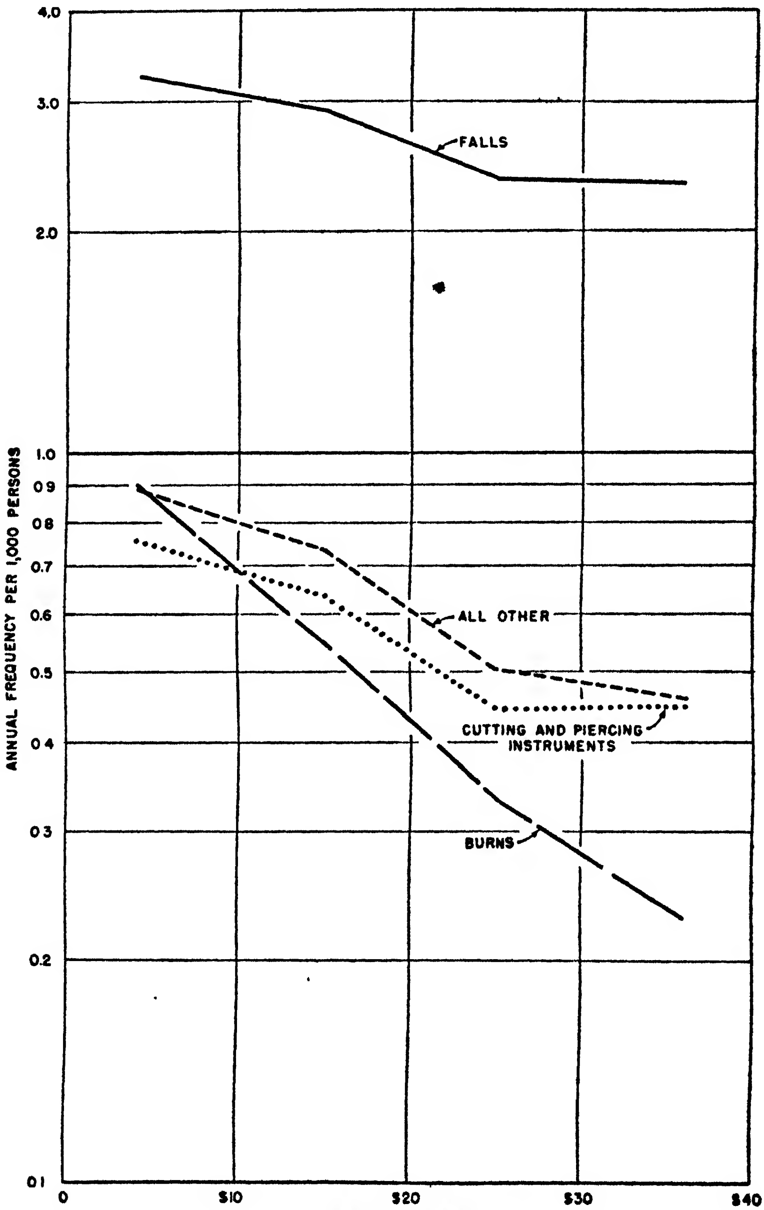

FIGURE 6.—Annual frequency of home accidents disabling for a week or longer, by means of injury and rental. (Households in rented multiple dwellings.)

ing; (2) selected diagnoses and crowding; (3) digestive diseases and toilet facilities; and (4) home accidents and rental (or value).

1. *Illness and crowding.*—The percentage of persons disabled annually for a week or longer was higher in households with more than one and a half persons per room (category *C*) than in households with one or less persons per room (category *A*). This association was found, in lesser degree, in the relief group and in the nonrelief group with annual family incomes under $1,000.

TABLE 15.—*Frequency of home accidents*[1] *disabling for a week or longer during 1 year, by ownership and type of dwelling, monthly rental or value, and means of injury*[2]

Ownership and type of dwelling: monthly rental or value	Means of injury							
	Falls	Cutting and piercing instruments	Burns	All other	Falls	Cutting and piercing instruments	Burns	All other
	Disabling home accidents per 1,000 persons				Ratio to rate for persons in dwellings of not less than $30 rental or $3,000 value (expressed as 100)			
Rented multiple dwelling:								
Under $10	3.25	0.758	0.904	0.889	142	170	395	192
$10 to $20	2.90	.626	.547	.725	127	140	239	157
$20 to $30	2.35	.442	.329	.508	103	99	144	110
$30 and over	2.29	.446	.229	.462	100	100	100	100
All rentals	2.59	.532	.419	.598				
Rented single dwelling:								
Under $10	2.65	.914	.700	1.128	97	225	232	187
$10 to $20	3.06	.731	.472	.769	112	180	156	127
$20 to $30	2.67	.544	.409	.674	98	134	135	112
$30 and over	2.73	.407	.302	.604	100	100	100	100
All rentals	2.83	.638	.451	.758				
Owned dwelling:								
Under $1,000	4.01	1.111	.432	1.049	119	221	190	174
$1,000 to $2,000	3.51	.939	.438	.866	104	187	193	143
$2,000 to $3,000	3.57	.548	.309	.748	106	109	136	121
$3,000 and over	3.37	.503	.227	.604	100	100	100	100
All values	3.44	.582	.271	.672				
All dwellings	2.97	.583	.377	.675				

[1] Sole, primary, and contributory diagnoses With minor exclusions, data based on the entire surveyed population, white and colored (2,415,000 persons).

[2] *Falls* relates to falls of persons and includes fractures and sprains unspecified as to means of injury. *Burns* comprises burns of any type (except those from electric currents). *Cutting and piercing instruments* includes infected wounds unspecified as to means of injury. The *all other* group is made up largely of accidents caused by machinery, animals, firearms, etc., and of poisonings (gas, food, plants, etc.). Homicides and suicides (including attempts) are excluded.

At specific income levels, persons disabled by acute illness on the day of the enumerator's visit were found relatively more frequently in congested households, while the proportion of persons disabled on the day of the visit and reported as having a chronic disease or impairment evidenced little relation to crowding.

2. *Selected diagnoses and crowding.*—There was a striking increase in the pneumonia rate with increased crowding, particularly within the relief group and the next higher income group (nonrelief, under $1,000). The relief group also showed a sharp rise in the tuberculosis rate with increase in crowding. Increases were also noted for influenza and rheumatism in the two lowest income groups.

Among children under 5 years of age, the common communicable diseases of childhood (except whooping cough) evidenced greater frequency with increased crowding. But more important, each of these diseases showed an earlier age incidence in crowded households as judged by the relative frequencies in age groups under 5 and 5 to 9.

3. *Digestive diseases and toilet facilities.*—The rate for persons in households without inside flush toilets not shared by other households showed a marked excess over the rate for persons in households having such facilities. This tendency was observed in virtually every area and city-size group.

4. *Home accidents and rental (or value).*—Frequency of home accidents disabling for a week or longer increased as rental of dwelling (or value, if owner-occupied) went down. This was true for each type of abode (dwellings having been classified into "rented multiple," "rented single," and "owned"), and for each age group. Males showed a much greater rise in home-accident rate with drop in rental than was true for females.

Each means of injury showed higher rates in dwellings of low rental. Frequency of disability from burns rose more rapidly with falling rental than that from any other means. It was followed closely, however, by the rise in frequency of accidents due to cutting and piercing instruments. There was a less rapid increase in the instance of falls.

VII. COMMENT

The inferences to be drawn from this material must necessarily be somewhat speculative in nature, because of the extreme intricacy of the whole question of the relation between housing and health.

The many complicating factors the effect of which cannot be eliminated satisfactorily—differences of income, of race, of educational and intelligence level, and of housekeeping efficiency, to name but a few—constitute a serious limitation upon the interpretation of the data. The most serious limitation perhaps lies in the element economic status. Sometimes disease or impairment cuts down income, or prevents entirely the earning of a livelihood, and so forces families into poor housing, the only kind they can afford. Sometimes low income causes or perpetuates disease by making impossible an adequate diet, proper medical care (at home or in institutions), and other essentials of healthful living. With low income often goes exposure

to unhealthful occupations. As a consequence of these inextricably interwoven factors, persons badly housed have excessive rates of illness and mortality quite apart from the influence of the housing conditions themselves.

In this report an attempt has been made to eliminate the effect of economic differences by making comparisons within certain broad income classes; but it is apparent that within each of these classes, differences in effective income with degree of crowding, together with a tendency for families overburdened by disease to drift into the crowded households, have prevented the complete isolation of the effect of housing itself. In fact, it may be stated categorically that no conclusion as to the precise role of housing per se in the illness experience of low-income families is possible from the material presented in this report, or indeed from any data now available. This statement is not to be interpreted as meaning that bad housing does not affect health. It is well recognized that there are certain essentials of a healthful home environment—a sufficient supply of pure water, sanitary sewage disposal, sufficient ventilation, heat, and light, space enough for ordinary family living, absence of excessive dampness, screening against mosquitoes and flies, freedom from fire and other accident hazards, adequate playgrounds and sunshine for children. Health is more than the mere absence of outright disease; it is a state of being in which all physical and mental processes approach their highest efficiency. That is possible only under satisfactory conditions of housing.

Despite the impossibility of assessing the precise effect of housing conditions, this report has established an important broad association between housing and health. Illness rates were found to be higher in congested households, especially for certain diagnoses; disabling digestive diseases were substantially more frequent in households not having a private inside flush toilet; and serious home accidents rose with drop in rental. Essentially, because of the interrelated nature of the indices, this association is to be regarded as one between illness and poor housing generally. *What has been demonstrated most clearly is that this excess illness rate, to whatever extent it is due to bad housing itself, occurs in the low-income, poorly housed populations, who are least able to meet the burden of disease.*

VIII. APPENDIX

TABLE 1.—*Distribution of 1,769,993 white persons in 83 cities, by economic status, age, and number of persons per room*

Annual family income and relief status, and age in years	All persons per room	A. 1 person or less per room	B. More than 1 person per room, but not more than 1.5	C. More than 1.5 persons per room
All incomes—all ages	1,769,993	1,326,543	296,132	147,318
Under 15	472,481	286,437	117,809	68,235
15-24	301,594	212,213	60,880	28,501
25-64	917,686	756,437	112,450	48,799
65 and over	78,232	71,456	4,993	1,783
Relief—all ages	285,470	141,025	79,650	64,795
Under 15	105,933	37,694	35,332	32,907
15-24	49,615	23,374	14,969	11,272
25-64	118,839	70,796	28,172	19,871
65 and over	11,083	9,161	1,177	745
Nonrelief:				
Under $1,000—all ages	345,687	249,783	61,726	34,178
Under 15	90,765	50,145	25,261	15,359
15-24	58,259	40,069	11,943	6,247
25-64	174,115	138,392	23,589	12,134
65 and over	22,548	21,177	933	438
$1,000 to $1,500—all ages	432,206	334,511	71,498	26,197
Under 15	117,343	76,586	29,049	11,708
15-24	72,101	52,746	14,049	5,306
25-64	226,557	190,413	27,247	8,897
65 and over	16,205	14,766	1,153	286
$1,500 to $2,000—all ages	332,939	274,286	45,563	13,090
Under 15	81,369	59,300	16,785	5,284
15-24	56,058	42,690	10,188	3,180
25-64	183,477	161,242	17,773	4,462
65 and over	12,035	11,054	817	164
$2,000 and over—all ages	373,691	326,938	37,695	9,058
Under 15	77,071	62,712	11,382	2,977
15-24	65,561	53,334	9,731	2,496
25-64	214,698	195,594	15,669	3,435
65 and over	16,361	15,298	913	150

TABLE 2.—*Distribution of 31,263 white persons with record of confinement or puerperal condition disabling for a week or longer during 1 year, by annual family income and relief status, age, and number of persons per room*

Annual family income and relief status, and age in years	All persons per room	A. 1 person or less per room	B. More than 1 person per room but not more than 1.5	C. More than 1.5 persons per room
All incomes:				
15-24	10,716	6,953	2,509	1,254
25-64	20,547	12,595	4,886	3,066
Relief:				
15-24	2,841	1,391	831	619
25-64	4,426	1,364	1,503	1,559
Nonrelief:				
Under $1,000:				
15-24	3,207	1,983	824	400
25-64	3,888	2,108	1,056	724
$1,000 to $1,500:				
15-24	2,801	2,126	522	153
25-64	5,201	3,507	1,213	481
$1,500 to $2,000:				
15-24	1,158	919	194	45
25-64	3,758	2,877	658	223
$2,000 and over:				
15-24	709	534	138	37
25-64	3,274	2,739	456	79

FACTORS INFLUENCING THE EFFICACY OF PHENOLIZED RABIES VACCINES

II. VIRUS CONTENT OF VACCINE[1]

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The purpose of these experiments was, first, to determine the relation of the immunizing power of rabies vaccines to their virus content and, second, to find what factors in the animal passage of fixed rabies virus determine the amount of virus in the brain.

With live influenza virus, Francis (*1*) has shown a fairly strict relationship between the amount of virus in the immunizing dose and the resulting immunity in mice. The same has been shown by Webster (*2*) for rabies virus when one intraperitoneal dose of live fixed virus was given to mice.

Similar experiments have not been reported with phenolized vaccines, except that various authors have shown greater efficiency of a larger number of doses (*3*), a more concentrated emulsion (*4*) in the vaccine, and a larger amount in each dose in relation to body weight (*5, 6*), all of which means that the more virus given the greater the immunity produced.

The question has rather recently been raised as to the possibility of the variations in the immunizing powers of different phenolized vaccines being due to variations in the amount of virus still viable after phenolization. Webster (*7*) has, to a certain degree, correlated these two factors and Lepine and Sautter (*8*) feel that the efficiency of a phenolized vaccine disappears at about the same time that it ceases to give evidence of still containing live virus. Fermi (*9*) explained the greater immunizing power of his vaccine phenolized at 23° C. over Semple's vaccine phenolized at 37° C. by the fact that there was more live virus left in the Fermi type after phenolization.

With reference to factors influencing the titer of virus in rabid animals, it is interesting to note that Lepine (*10*) has shown a decrease in the titer of cords of rabbits over a period of years as the Pasteur strain of fixed virus has been carried by intracerebral passages. At the same time there has been an increase in the virulence (titer) of the brains.

Covell and his coworkers (*11*) have demonstrated a much higher protection in monkeys immunized with a vaccine made from animal brain virus than with vaccine made from the same animal's cord.

Cumming (*12*) found that rabbits killed at the beginning of paralysis from fixed virus rabies had more virus in their brains than those killed after several days of paralysis or allowed to die.

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[1] From the Division of Biologics Control, National Institute of Health. The preceding article in the series is: Factors influencing the efficacy of phenolized rabies vaccines. I. Strains of fixed virus. Pub. Health Rep., 55: 1619-1631 (1940).

RELATION OF AMOUNT OF VIRUS IN IMMUNIZING DOSE OF ANTIRABIES VACCINE TO IMMUNITY PRODUCED IN MICE

Amount of virus varied by dilution of phenolized vaccine.—A phenolized vaccine consisting of a 5 percent emulsion of fixed rabies virus rabbit brain with 0.5 percent phenol was prepared, using a strain of fixed virus known to be highly immunizing. A dose of 0.25 cc. of this vaccine was given intraperitoneally every second day for 6 doses to groups of 20 female Swiss mice 1 month of age (11–15 grams). One group of mice received the vaccine diluted 1:10, another 1:25, and a third 1:50. Twenty-one days from the start of the immunization each group was subdivided into lots of 4 mice each and the mice were given, intracerebrally, serial tenfold dilutions of a heterologous strain of fixed rabies virus as the test dose. Mice were observed 21 days before being discharged.

Table 1A shows irregular results in the group receiving the 1:10 dilution of vaccine owing to deaths from causes other than rabies, but apparently there was protection against 1,480 M. L. D. The vaccine diluted 1:25 and the 1:50 dilution gave but 45 M. L. D. and 59 M. L. D. protection, respectively.

TABLE 1A.—*Relation of amount of virus in immunizing dose of antirabies vaccine to immunity produced. Amount of virus varied by dilution of a single phenolized vaccine*

Dilution of vaccine [1]	Test dose dilutions fixed virus intracerebrally (Number rabies deaths/number tested)						Number of M. L. D.[2] protection (Dil = 1 M. L. D.)
	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	
1:10	2/3	0/3	2/4	1/3			1,480
1:25	4/4	4/4	3/4	0/4	0/3		45
1:50	4/4	4/4	2/4	1/4	0/3		59
Controls				4/4	2/4	0/4	(1/1,000,000)

[1] Six intraperitoneal doses of 0.25 cc. every 2 days to Swiss mice. Test dose on 21st day.
[2] Fifty percent end points.

Amount of virus varied in different vaccines (live virus, and phenolized virus vaccines).—In order to determine the relation of the degree of immunity produced by a vaccine to its virus content, a method was sought of varying the amount of the same strain of fixed virus in the brains of different rabbits. Then, by making vaccines from these brains, all factors (percent brain emulsion, amount of phenol) would be equal except for the virus content.

Four rabbits weighing 1,500 to 2,000 grams were injected intracerebrally with 0.2 cc. of the supernatant from a 1:10 dilution of a strain of fixed rabies virus. Rabbit 100 developed slight weakness on the fifth day, when it was killed with chloroform. Rabbit 103 also developed weakness on the fifth day and was paralyzed on the sixth day, when it was killed. Rabbit 101 had weakness on the fifth day

and was paralyzed on the sixth, seventh, and eighth days, when it was killed. Rabbit 102 showed slight weakness on the fourth day and was paralyzed on the fifth, sixth, seventh, eighth, and ninth days, when it was allowed to die.

These brains were emulsified separately and their virus content titered by intracerebral inoculation of serial tenfold dilutions into young Swiss mice (12–15 grams). Each emulsion was made up to 20 percent with normal saline, then divided into two parts. One part was then diluted to a 5 percent emulsion with normal saline solution while the other was mixed with equal parts of 2 percent phenol in saline, placed in the incubator at 37° C. for 24 hours, and then diluted to a 5 percent emulsion with 0.5 percent phenol.

Table 1B shows the vaccines thus prepared with the titers of the original brains.

TABLE 1B.—*Relation of amount of virus in immunizing dose of antirabies vaccine to immunity produced. Amount of virus varied in different vaccines*

Vaccines[1]	Number of days after inoculation rabbit killed	Titer of original brain emulsion	Test dose dilutions fixed virus intracerebrally (Number rabies deaths/number tested)								Number of M. L. D. protection (Dil.= 1 M. L. D.)
			1:10	1:20	1:100	1:1,000	1:2,000	1:100,000	1:1,000,000	1:10,000,000	
I. Brain No. 100	5	10^{-4}	----	----	----	----	----	----	----	----	
(a) Live virus vaccine	----	----	0/5	0/4	0/3	0/4	1/3	----	----	----	316,300+
(b) Phenolized vaccine	----	----	4/4	2/3	5/5	3/3	1/3	----	----	----	2,174
II. Brain No. 101	8	10^{-5}	----	----	----	----	----	----	----	----	
(a) Live virus vaccine	----	----	0/4	1/4	0/4	0/4	0/4	----	----	----	316,300+
(b) Phenolized vaccine	----	----	4/4	1/4	3/5	0/3	1/4	----	----	----	70,288
III. Controls	----	----	----	----	----	----	----	4/4	3/3	0/4	(1/3,163,000)

[1] 0.25 cc of 1:10 dilution intraperitoneally on 1st, 8th, 12th, 16th, 18th, 20th, 22d, 24th, 26th and 28th days Test dose on 30th day.

The vaccines were stored at 5° C. for 21 days, during which time the titers were being completed. At that time groups of 20 one-month-old female Swiss mice were immunized with the live and phenolized vaccines made from the brain of Rabbit 100, killed on the fifth day, and the live and phenolized vaccines made from the brain of Rabbit 101, killed on the eighth day. The titer of the brain of Rabbit 100 was 10^{-4}, and that of Rabbit 101, 10^{-5}. Control mice were set aside at this time.

Mice were given 0.25 cc. of a 1:10 dilution of the vaccines on a protracted schedule because it had been previously found that repeated intraperitoneal injections of heavy emulsions of live virus in young mice will infect them with rabies. Vaccines were given at 1, 8, 12, 16, 18, 20, 22, 24, 26, and 28 days. On the thirtieth day, or 2 days after the last dose of vaccine, the test dose of a heterologous strain of fixed virus in serial tenfold dilutions was injected intracerebrally.

Table 1B shows the results with each of the four vaccines. Both vaccines containing the live virus protected against at least 316,300 M. L. D., whereas the vaccine titering at 10^{-4} when phenolized gave 2,174 M. L. D. protection as compared to 70,288 M. L. D. immunity afforded by the vaccine with a titer of 10^{-5}.

FACTORS DETERMINING TITER OF FIXED RABIES VIRUS IN BRAIN OF PARALYZED ANIMALS

Having found that the amount of virus injected tended to determine the degree of immunity produced, it became of practical importance to evaluate those factors which might influence the amount of virus in the brain of the experimental animal with fixed virus rabies.

Species of animals used.—It is known among the manufacturers of canine rabies vaccines for which sheep and horse fixed virus rabies brains are used that the titer of virus in the brains of these larger animals is usually lower than in the rabbit. The logical explanation of this is that the virus has its highest concentration in certain smaller nuclei at the base of the brain (*13*), and in emulsifying the entire brain the virus is diluted according to the ratio of the relative size of these nuclei to the rest of the brain (cerebral cortex, cerebellum, white substance), which ratio is less in the larger animals.

Amount of virus injected.—In most laboratories making rabies vaccine, at the time the animals are injected with the fixed virus a heavy emulsion is made and inoculated uncentrifuged. The apparent reason for this is to make sure that all the animals will develop the disease.

Mouse passage fixed virus was injected intracerebrally into Swiss mice weighing 20 to 25 grams. Three mice each received 1:10 emulsion uncentrifuged, 1:10 supernatant, 1:1,000 dilution of the supernatant, and 1:100,000 dilution of the supernatant. All mice were killed on the first day of definite symptoms, the brains of the 3 mice in each group being pooled and titered by intracerebral inoculation of serial tenfold dilutions in 1-month-old Swiss mice.

Table 2 shows that the 1:10 uncentrifuged original inoculation produced a titer of 10^{-5}, the 1:10 supernatant a titer of 10^{-6}, the 1:1,000 dilution 10^{-7}, and 1:100,000 dilution 10^{-6}.

This experiment was then repeated in rabbits. Rabbit 108 received 0.2 cc. intracerebrally of uncentrifuged 1:10 emulsion of a mouse passage brain of fixed virus. Rabbits 109 and 110 were injected intracerebrally with the same amount of 1:10 emulsion supernatant, and rabbits 111 and 112 with a 1:1,000 dilution of this supernatant. Rabbit 113 received 1:10,000 dilution of the supernatant.

All rabbits were killed with chloroform on the first day of complete paralysis, and the brains were removed and emulsified at 1:10 dilution. This emulsion was centrifuged at 1,000 r. p. m. for 10 minutes and

serial tenfold dilutions made in normal saline from the supernatants. Three-hundredths cc. of the 10^{-4}, 10^{-5}, and 10^{-6} dilutions for each group were injected intracerebrally into 3 Swiss mice 1 month of age.

Table 2 shows the incubation period and the titer for each type of original inoculum. The brain of the rabbit receiving the 1:10 uncentrifuged emulsion titered at 10^{-4} as did also the brains of the rabbits which received the 1:10 supernatant and 1:10,000 dilution. However, the brains of the 2 rabbits inoculated with the 1:1,000 centrifuged emulsion had a titer of 10^{-6}.

TABLE 2.—*Effect of amount of virus inoculated intracerebrally on titer of brains at time of complete paralysis*

Animal inoculated	Number of animals inoculated	Dose inoculated intracerebrally	Incubation period (days)	Titer of brains
Mouse	3	0.03 cc. 1:10 emulsion uncentrifuged	6-6-6	10^{-5}
Do	3	0.03 cc. 1:10 emulsion supernatant	6-6-6	10^{-6}
Do	3	0.03 cc. 1:1,000 emulsion supernatant	8-8-8	10^{-7}
Do	3	0.03 cc. 1:100,000 emulsion supernatant	9-10-11	10^{-6}
Rabbit	1	0.2 cc. 1:10 emulsion uncentrifuged	5	10^{-4}
Do	2	0.2 cc. 1:10 emulsion supernatant	5-5	10^{-4}
Do	2	0.2 cc. 1:1,000 emulsion supernatant	6-6	10^{-6}
Do	1	0.2 cc. 1:10,000 emulsion supernatant	8	10^{-4}
Do	3	0.2 cc. 1:10 emulsion uncentrifuged	0-6-6	10^{-3}
Do	3	0.2 cc. 1:1,000 emulsion supernatant	7-7-9	10^{-4}

The validity of these results was again tested in rabbits. Rabbits 132, 133, and 134 were given intracerebrally 0.2 cc. of a 1:10 uncentrifuged emulsion of a fixed virus. At the same time Rabbits 129, 130, and 131 received intracerebrally 0.2 cc. of the same virus emulsion supernatant diluted to 1:1,000.

Of the group receiving the heavy emulsion, Rabbit 134 died of trauma, while the other 2 animals were completely paralyzed on the sixth day. In the group inoculated with the 1:1,000 dilution of virus, complete paralysis did not develop until the seventh day in 2, and the ninth day in the third rabbit. All were killed with chloroform on the first day of paralysis.

The brains of Rabbits 132 and 133 were combined for one group and those of Rabbits 130 and 131 for the other. They were weighed, emulsified at 1:10, then diluted in salt solution in serial tenfold dilutions, 0.03 cc. of each dilution from 10^{-4} to 10^{-7} being inoculated intracerebrally in young Swiss mice. As shown in table 2, the brains of the rabbits inoculated with the 1:10 uncentrifuged emulsion titered at less than 10^{-4}, while those of the rabbits receiving the 1:1,000 dilution titered at 10^{-4}.

These results have recently been confirmed by Hampil [2] at the Sharp and Dohme Laboratories.

[2] Personal communication.

Time during disease when animals were killed.—Rabbits 80, 81, and 82 were inoculated intracerebrally with 0.2 cc. of the supernatant of a 1:10 emulsion made from a rabbit passage brain of fixed virus.

Rabbit 81 had slight weakness on the fourth day when it was killed with chloroform. Rabbit 80 was weak on the fourth day, partially paralyzed on the fifth, and completely paralyzed on the sixth day, and was then killed. Rabbit 82 likewise was weak on the fourth, partially paralyzed on the sixth, seventh, eighth, ninth, tenth, and eleventh days, and was killed on the eleventh day.

The brains of these rabbits were emulsified at 1:10 dilution, centrifuged, and serial tenfold dilutions made in normal saline from the supernatants. Three-hundredths cc. of the 10^{-3} to 10^{-6} dilutions were injected intracerebrally into 3 Swiss mice 1 month of age.

Table 3 shows that the rabbit killed on the first day of symptoms had a brain titer of 10^{-3}; that killed on the third day of symptoms had a titer of 10^{-4}; and the rabbit killed on the eighth day of symptoms had a titer of 10^{-4}.

TABLE 3.—*Effect of duration of symptoms at time rabbit killed on titer of brain*

Rabbit number	Strain of virus inoculated	Day after inoculation killed	Titer of brains
81	1	4	10^{-3}
80	1	6	10^{-4}
82	1	11	10^{-4}
100	2	5	10^{-4}
103	2	6	10^{-5}
101	2	8	10^{-5}
102	2	[1] 8	10^{-5}

[1] Died on 8th day.

This experiment was repeated, using a 1:10 centrifuged emulsion of a different strain of fixed virus. Rabbits 100, 101, 102, and 103 received 0.2 cc. intracerebrally. Rabbit 100 had weakness on the fifth day and was killed. Rabbit 103 was weak on the fifth day and paralyzed on the sixth, when it was killed. Rabbit 101 also was weak on the fifth and paralyzed on the sixth, seventh, and eighth days, when it was sacrificed. Rabbit 102 was weak on the fourth day, paralyzed on the fifth, sixth, seventh, and eighth days, when it died.

Titers of brains were done in the same manner as in the first part of this experiment and the results are shown in table 3. There was a titer of 10^{-4} when the rabbit was killed on the first day of symptoms, 10^{-5} when killed on the second day, and 10^{-5} when killed on the fourth day, and not definite but at least 10^{-5} when allowed to die.

Method of killing paralyzed animals.—In order to determine whether chloroform used in killing the paralyzed rabbit might also destroy some of the virus in the brain, Rabbits 1 and 2 were given intracerebrally 0.2 cc. of a 1:10 emulsion supernatant of a mouse passage

fixed virus. Both rabbits were completely paralyzed on the seventh day. Rabbit 7 was killed with chloroform and Rabbit 2 was bled to death. The brains of these animals were titered in the same manner previously described. Both brains had a titer of 10^{-3}.

Time interval from removal of rabies brain to emulsification.—In some laboratories the rabies brains are harvested, then placed in 50 percent glycerin in the refrigerator for a variable period before being emulsified and made up into vaccine.

Rabbit 1 was given 0.2 cc. of 1:10 emulsion supernatant intracerebrally. On the seventh day it was completely paralyzed and was killed with chloroform. The brain was divided in half. One-half was placed in 50 percent glycerin at 0° C. while the other half was emulsified and titered in young Swiss mice. One month from the removal of the brain from the rabbit the half of brain in glycerin was emulsified and similarly titered. The titer, which had originally been over 10^{-3}, had fallen to less than 10^{-2} during the 1-month storage in glycerin.

Rapidity of passage transfer.—Three Swiss mice (15–20 grams) received 0.03 cc. intracerebrally of the supernatant from a 1:10 emulsion of rabbit brain fixed virus which had been stored in glycerin for 5 months. These mice were killed on the sixth or seventh day with paralysis and the amount of virus in a single emulsion of the three brains was titered intracerebrally in Swiss mice. The titer was 10^{-4}. This 1:10 emulsion supernatant from the first mouse passage was immediately injected intracerebrally into 3 more Swiss mice. An immediate passage of a 1:10 emulsion supernatant was repeated each time the injected mice showed paralysis until the virus had been carried through 11 rapid intracerebral mouse passages.

The brains of the paralyzed mice in passage No. 11 were again titered for virus content and found to be 10^{-5}. This represented a tenfold increase over the titer of the first mouse passage.

This same procedure was repeated with a different strain of fixed virus with the exception that each mouse passage brain emulsion was made to a 1:1,000 dilution before injecting the mice of the next passage. Here both the first and tenth passage brains titered at 10^{-4}.

Titer of cord compared to brain.—Rabbit 141 was given 0.2 cc. of the supernatant of a 1:10 dilution of fixed rabies virus intracerebrally. It was killed on the sixth day when paralyzed, the brain and cord were removed and weighed. The brain weighed 8.3 gm. and the cord 3.1 gm. The brain and cord were emulsified with salt solution to a 10 percent emulsion, centrifuged, and the tenfold dilutions made. Three hundredths cc. of the 10^{-3}, 10^{-4}, 10^{-5}, and 10^{-6} dilutions were injected intracerebrally into 3 mice. The brain emulsion titered at 10^{-4} and the cord emulsion at less than 10^{-3}.

This was repeated with Rabbit 139 and here the weights of brain and cord were 11 gm. and 3.3 gm., respectively. However, both brain and cord emulsions titered at 10^{-4}.

The brain and cord of Rabbit 137 was also titered in the same way. The brain weighed 10 gm. and the cord 2.9 gm. The brain emulsion here titered at 10^{-4} and the cord at 10^{-3}.

DISCUSSION

From the results of the experiments here reported it is apparent that with any one strain of fixed rabies virus the amount of virus injected in mice, whether in the form of live or phenolized vaccine, will, in part, determine the degree of immunity produced.

In the clinical use of rabies vaccine in man the amount of virus injected can be increased by using a larger dose (usual dose 2 cc.), more doses (usual number 14 or 21), or a heavier emulsion (usual emulsion 2 to 8 percent). However, the amount of increase by these procedures is limited through physical considerations and the degree of local reaction to the subcutaneous injection of so much foreign material. Therefore, it is more desirable to increase the titer of the animal brains supplying the virus so that the amount of virus per unit weight of brain material will be greater.

From the results of these experiments the recommended technique of animal passage to produce the greatest virus content in the brains preparatory to the manufacture of rabies vaccines would be as follows:

A comparatively small animal such as the rabbit should be given intracerebrally 0.20 to 0.25 cc. of a 1:1,000 dilution of the supernatant from the previous passage brain. This animal should be killed after it has been completely paralyzed for at least 1 day, and preferably 2 days. It may be killed either by chloroform or by exsanguination and the brain on removal may be kept for a short period of time in 50 percent glycerin but probably less loss of virus will take place if it is stored in the frozen state at −10° C. or lower.

Higher virus content per unit weight of nervous tissue will probably be obtained if only the brain is used in making the vaccine, the cord being discarded.

The rapidity with which the animal passages are made apparently does not influence the amount of virus present in the paralyzed rabid animal.

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COMPLEMENT FIXATION IN ENDEMIC TYPHUS FEVER

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Complement fixation in endemic typhus fever has been investigated for the purpose of determining whether this test may be of value in the diagnosis of this disease.

Castaneda (*1*) has studied complement fixation in typhus, using sera from cases of Mexican typhus and Brill's disease and from guinea pigs infected with Mexican typhus and European typhus virus. His results showed that typhus-immune sera contained complement-binding antibodies for *Rickettsia prowazeki* (Mexican type). Tests for specificity were not done except with the serum from a guinea pig infected with European typhus. Considering other rickettsial diseases, the writer has shown that complement fixation may be used in detecting "Q" fever and that results so far secured indicate that the test is specific (*2*).

Material and methods.—The sera employed in the tests were from recovered human cases of endemic typhus, Rocky Mountain spotted fever, and "Q" fever, and from guinea pigs recovered from infections with endemic typhus, European typhus, Rocky Mountain spotted fever, and "Q" fever. A number of the human sera were from cases occurring as the result of laboratory infections. Normal human and guinea pig sera were used as controls.

Antigens were prepared from the yolk sac of embryos infected according to the method of Cox (*3*) and also from the lungs of mice infected intranasally according to the method of Castaneda (*4*), except that the inoculum of the mice was heavily infected yolk sac instead of infected guinea pig tunica vaginalis. The yolk sac of chick em-

bryos became heavily infected after several passages through embryos, smears of such material showing innumerable rickettsiae. The mouse material similarly showed very numerous rickettsiae, the animals succumbing to the infection on the third day. Suspensions of rickettsiae were prepared by the method previously described (*2*). Merthiolate to a dilution of 1:10,000 was added as preservative. Both the yolk sac and the mouse lung material proved satisfactory antigens. The strain of virus used was one obtained from infected fleas on a wild rat captured in January 1941. This strain was shown by cross protection tests to be identical with the Wilmington strain which is one of the original strains of endemic typhus carried routinely in this laboratory.

The antigens were titrated with a known guinea pig serum and usually diluted 1:8, the highest dilution in which a reading of 4+ fixation was obtained.

The test.—The usual hemolytic system consisting of sheep cells, guinea pig complement, and rabbit anti-sheep-cell amboceptor was employed. The amboceptor was diluted to contain 2 units in 0.2 cc. and equal amounts of amboceptor dilution and a 5-percent dilution of sheep cells were mixed. The complement was titrated on the day of the test.

Sera were inactivated for one-half hour at 56° C. Dilutions were made ranging from 1:2 to 1:64 or to 1:256 and occasionally to 1:2,048, and 0.2 cc. of each dilution was used in the test. Complement was diluted to contain 2 units in 0.2 cc. A suitable dilution of antigen was added in 0.2 cc. amounts. Fixation was carried out for 1 hour in a 37° C. water bath, following which 0.4 cc. of sensitized cells was added to each tube and incubation continued for another hour. Readings were made the following morning after storage at cold room temperature. Complete fixation is denoted by 4 and complete hemolysis by 0.

Results.—The results obtained with human and guinea pig endemic typhus sera are shown in table 1 and tests for specificity in table 2. Table 3 shows the development of complement fixing bodies in two human typhus cases and also the results of parallel Weil-Felix tests.

TABLE 1.—*Complement fixation with endemic typhus sera*

Serum number	Time after onset	Dilutions of sera											Serum controls (no antigen)				Weil-Felix titer[1]
		1:2	1:4	1:8	1:16	1:32	1:64	1·128	1:256	1.512	1.1024	1.2048	1:2	1:4	1:8	1:16	
Human:																	
CK	5 years	4	4	4	4	4	2	1	0				0	0	0	0	
WW	9 years	3	tr	0	0	0	0	0	0				0	0	0	0	
IB	18 months	4	4	4	4	2	0	0	0				0	0	0	0	1:160
SS	17½ months	4	4	4	4	4	3	2	1				0	0	0	0	1·160
HT	18 months	4	4	4	4	4	3	2	1				0	0	0	0	1:80
GH	17½ months	4	4	4	3	1	0	0	0				0	0	0	0	0
RB	Normal	0	0	0	0	0	0	0	0				0	0	0	0	
LH	do	0	0	0	0	0	0	0	0				0	0	0	0	
Guinea pig.																	
W8441	6 days	4	4	4	4	4	4	3	2				1	0	0	0	
WR26717	12 days	4	4	4	4	4	4	4	4	4	2	1	0	0	0	0	
W8423	13 days	4	4	4	4	4	4	3	2				tr	0	0	0	
W8409	22 days	4	4	4	4	4	4	4	3				tr	0	0	0	
W8406	55 days	4	4	4	4	4	4	4	4				2	tr.	0	0	
Normal		0	0	0	0	0	0	0	0				0	0	0	0	

Controls Hemolytic system, 0, antigen, 0, sensitized cells, 4
4=complete fixation, tr.=trace of fixation, 0=complete hemolysis.

[1] Weil-Felix titer during illness. CK, 1:20480, WW, 1:2560; IB, 1:1280, SS, 1:2560; HT, 1.40960; GH, 1:320.

Discussion.—Positive fixation was obtained with all sera from recovered human endemic typhus cases and from all guinea pigs inoculated with endemic typhus virus. Two of the human cases dated back 9 years and one of these showed 3+ fixation in dilutions up to 1:16, the other 3+ in a 1:2 dilution. A case dating 5 years ago gave 4+ fixation in dilutions up to 1:32. The group of 4 cases dating 17½ to 18 months prior to the time of drawing sera for the test all showed complete fixation in dilutions 1:8 to 1:32. In general, the results of the test with these 4 sera parallel the severity of the illness, the 2 cases SS and HT with 4+ fixation in 1:32 dilution and 3+ in 1:64 dilution being more severe than those of IB and GH, with 4+ and 3+ fixations in a 1:16 dilution.

When daily specimens of serum from typhus cases are tested, the titer of the complement fixing bodies increases beginning with the sixth or seventh day (table 3). This parallels more or less the increase in the Weil-Felix titer.

In guinea pigs complete fixation was obtained in a dilution of 1:64 in 6 days after onset of fever. In one guinea pig complete fixation in 1:512 dilution occurred on the twelfth day after the beginning of fever. Fixation in high dilutions also occurred in guinea pigs 22 days and 55 days after the beginning of fever.

Table 2.—*Tests for specificity*

Serum number	Disease	Date of onset	Dilutions of sera								Controls (no antigen)				Weil-Felix test
			1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:2	1:4	1:8	1:16	
Human:															
RD	Endemic typhus	9 years	3	3	3	3	0	0	0	0	0	0	0	0	1:40
HT	do	18 months	4	4	4	4	4	4	3	2	0	0	0	0	1:80
PC	do	3½ months	4	4	4	4	4	4	4	1	0	0	0	0	1:640
NT	Rocky Mountain spotted fever	3 years	0	0	0	0	0	0	0	0	0	0	0	0	0
DT [1]	do	20½ months	0	0	0	0	0	0	0	0	0	0	0	0	0
JY [1]	do	9 months	0	0	0	0	0	0	0	0	0	0	0	0	0
TB [1]	do	7 months	0	0	0	0	0	0	0	0	0	0	0	0	1:40
SS	do	do	0	0	0	0	0	0	0	0	0	0	0	0	0
HL	R. M. S. F. vaccine	3 inoculations	0	0	0	0	0	0	0	0	0	0	0	0	
LP	do	do	0	0	0	0	0	0	0	0	0	0	0	0	
JW	do	do	0	0	0	0	0	0	0	0	0	0	0	0	
AK	"Q" fever	3 months	0	0	0	0	0	0	0	0	0	0	0	0	
WH	do	4 months	0	0	0	0	0	0	0	0	0	0	0	0	
WJ	Normal		0	0	0	0	0	0	0	0	0	0	0	0	
Guinea pig:															
26663	Endemic typhus	21 days	4	4	4	4	4	4	4	4	0	0	0	0	
W8409	do	22 days	4	4	4	4	4	4	4	4	0	0	0	0	
B5295	European typhus	10 days	3	2	1	tr.	0	0	0	0	0	0	0	0	
B5253	do	60 days	3	3	2	1	0	0	0	0	0	0	0	0	
BR3476	Rocky Mountain spotted fever	16 days	1	0	0	0	0	0	0	0	1	0	0	0	
BR3423	do	72 days	1	0	0	0	0	0	0	0	tr.	0	0	0	
26628	"Q" fever	23 days	1	tr.	0	0	0	0	0	0	1	tr.	0	0	
25925	do	123 days	0	0	0	0	0	0	0	0	0	0	0	0	
Normal 1			0	0	0	0	0	0	0	0	0	0	0	0	
Normal 2			0	0	0	0	0	0	0	0	0	0	0	0	

Controls: Hemolytic system 0; antigen 0; sensitized cells 4.

[1] Sera received through the courtesy of Dr. G. R. Carpenter, Health Officer, Fairfax County, Va.

TABLE 3.—*Development of complement fixing antibodies*

Serum	Days after onset	Dilutions of sera								Serum controls				Weil-Felix titer
		1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:2	1:4	1:8	1:16	
HT	6	0	0	0	0	0	0	0	0	0	0	0	0	1:80
	8	tr.	tr.	0	0	0	0	0	0	0	0	0	0	1.320
	9	1	1	tr.	0	0	0	0	0	0	0	0	0	1:1280
	10	4	4	3	1	tr.	0	0	0	0	0	0	0	1:2560
	11	4	4	4	4	2	0	0	0	0	0	0	0	1:5120
	12	4	4	4	4	4	3	0	0	0	0	0	0	1:10240
	13	4	4	4	4	4	4	3	1	0	0	0	0	1.10240
	14	4	4	4	4	4	4	4	3	0	0	0	0	1:20480
	15	4	4	4	4	4	4	4	4	0	0	0	0	1:20480
	16	4	4	4	4	4	4	4	4	0	0	0	0	1:40960
SS	7	2	2	1	1	0	0	0	0	0	0	0	0	1·320
	8	3	3	2	1	tr	0	0	0	0	0	0	0	1·2560
	14	3	3	3	2	1	tr.	0	0	0	0	0	0	1:5120
Normal	-------	0	0	0	0	0	0	0	0	0	0	0	0	--------

Hemolytic system 0; antigen 0, sensitized cells 4.

The specificity of the test is shown in the results obtained with human sera from recovered Rocky Mountain spotted fever and "Q" fever cases and from individuals who had received inoculations of spotted fever vaccine. No fixation was obtained with any of these sera. A certain amount of cross fixation is shown in the results obtained with sera from guinea pigs infected with European typhus. Complement fixation tests with a European typhus antigen will probably yield more information on this phase of the subject.

Conclusions.—The results obtained in the tests described indicate the usefulness of complement fixation in detecting recent and also past infection with endemic typhus virus. The sensitivity of the test is indicated by the results with sera from cases in which infection occurred as long as 9 years ago and as recently as 7 days.

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PROVISIONAL MORTALITY RATES FOR THE FIRST 9 MONTHS OF 1940

The mortality rates in this report are based upon preliminary data for 39 States, the District of Columbia, and Alaska for the first 9 months of 1940. Comparative data for the first 9 months of 1938 and 1939 are presented for 34 States and the District of Columbia. This report is made possible through arrangement with the respective

States which voluntarily furnish provisional monthly tabulations of current birth and death statistics to the United States Public Health Service which analyzes and publishes the data. Because of lack of uniformity in the method of classifying deaths according to cause as well as some delay in filing certificates, these data are preliminary and may differ in some instances from the final figures subsequently published by the Bureau of the Census.[1]

In the past, however, these preliminary reports have accurately reflected the trend in mortality rates for the country as a whole.

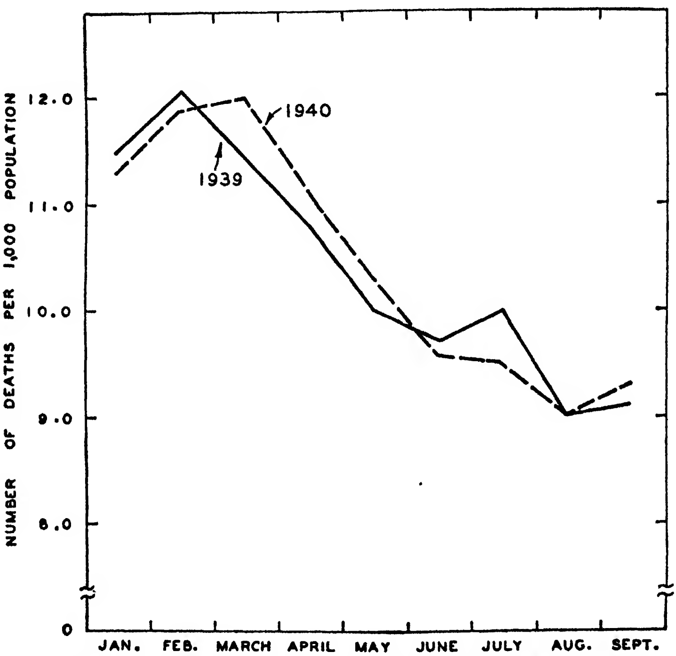

FIGURE 1.—Death rates per 1,000 population, by months, 1939 and 1940.

Some deviation from the final figures, especially those for specific causes of death, for individual States may be expected because of the provisional nature of the information. Nevertheless, it is believed that the trend in mortality within each State is correctly represented. Comparisons of specific causes of death for different States are subject to error because of variations in tabulation procedure and promptness of filing the original certificates. Such comparisons should be based upon the final figures published by the Bureau of the Census.

The death rate from all causes during the first 9 months of 1940, 10.5 per 1,000 population, was slightly less than the corresponding rate, 10.6, for 1939 and equal to the rate in 1938 when the lowest rate in the history of the registration area was reported. This low mor-

[1] Populations for all years are estimated as of July 1 from the 1930 and final counts from the 1940 Census.

tality rate is the result primarily of a relatively low prevalence of the principal communicable diseases. The mortality from influenza, although higher than in 1938, was about 13 percent less than in 1939. The death rate from pneumonia was 12 percent less than in 1939 and 19 percent less than in 1938.

The principal communicable diseases of childhood—measles, diphtheria, whooping cough, and scarlet fever—took only about 60 percent as many deaths in the first three quarters of 1940 as during the corresponding period of 1939. The decline in the mortality from tuberculosis while small, 4 percent, continued the downward trend in the mortality from this disease. Other diseases with a lower death rate in 1940 than in 1939 were typhoid fever, diarrhea and enteritis (under 2 years), and diseases of the digestive system.

Both the infant mortality and maternal mortality rates were the lowest in recent years. Unless there is a sharp rise in the maternal mortality rate during the last quarter of the year, 1940 will be the eleventh consecutive year of decline in this rate.

The minor epidemic of poliomyelitis during the third quarter of the year resulted in an increased death rate as compared with the 2 previous years. Increased death rates were observed for the principal diseases of late adult life, cancer, diabetes, cerebral hemorrhage, heart disease, and nephritis. The increase in the rates for these diseases results in part from the aging of the population.

The relative number of fatal accidents exclusive of automobile accidents has remained practically unchanged during the past 3 years. Mortality from automobile accidents, however, increased about 5 percent over 1939. This increase was widespread; 26 of the 37 States reported a higher rate for the first three quarters of 1940 than for the corresponding period of 1939.

The birth rate remained unchanged at 16.8 per 1,000 population. The crude rate of natural increase was 6.3 per 1,000 population.

Provisional mortality from certain causes in the first 9 months of 1940, with comparative provisional data for the corresponding period in preceding years

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis (under 2 years) (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
35 STATES [1]																								
January-September:																								
1940	10.5	16.8	45	3.7	0.9	0.5	0.5	1.9	0.8	44.1	15.2	0.3	0.6	0.6	118.5	26.9	89.8	294.3	53.6	54.5	5.4	77.8	67.8	21.3
1939	10.6	16.8	47	3.9	1.4	.5	.7	2.3	1.1	45.8	17.5	.9	.4	.5	117.5	26.3	86.7	233.5	61.3	59.1	7.2	74.9	66.7	20.2
1938	10.5	17.2	50	5.0	1.5	.8	1.0	3.7	1.4	47.7	11.5	3.1	.3	.6	115.4	24.3	83.1	266.1	65.9	63.7	10.3	77.0	67.8	21.0
January-March:																								
1940	11.7	15.7	53	4.0	.5	.6	.9	1.8	1.2	45.2	32.5	.4	.3	.5	119.6	31.8	101.2	337.5	86.1	51.7	4.2	88.3	65.3	18.5
1939	11.9	16.2	55	4.2	.9	.7	1.1	2.6	1.7	47.0	33.3	1.4	.1	.5	118.5	30.4	96.8	327.0	105.4	54.6	4.1	85.1	62.4	18.1
1938	11.4	16.6	52	5.2	.7	1.2	1.5	3.4	1.5	48.5	21.9	4.2	.3	.6	114.8	26.9	90.0	292.5	104.3	55.2	4.1	83.3	63.5	19.7
April-June:																								
1940	10.3	16.5	44	3.9	.7	.5	.5	1.9	.6	46.0	10.2	.5	.2	.6	117.1	25.8	88.2	292.4	46.9	51.6	3.0	77.6	64.1	20.5
1939	10.5	16.4	47	4.0	.8	.5	.6	2.4	.7	48.4	16.3	1.2	.3	.4	117.8	26.1	86.7	281.9	52.3	57.5	6.0	75.7	66.0	18.9
1938	10.5	16.9	51	5.1	1.1	.8	1.0	4.1	1.0	49.9	8.6	4.3	.3	.6	115.7	24.4	83.7	268.6	60.2	65.0	10.3	78.9	64.0	19.2
July-September:																								
1940	9.5	18.0	40	3.3	1.5	.3	.3	1.9	.6	41.1	3.1	.2	1.3	.6	118.7	23.2	80.0	253.6	27.9	60.2	9.0	67.5	73.6	24.8
1939	9.3	17.8	41	3.6	2.4	.4	.2	2.0	1.0	42.0	3.2	.3	.9	.5	116.1	22.4	76.8	242.4	27.0	65.2	11.4	63.8	71.8	23.6
1938	9.6	18.1	47	4.7	2.7	.5	.5	3.5	1.2	44.8	4.1	.8	.4	.7	115.7	21.6	75.9	237.9	33.8	70.8	16.3	68.8	75.7	24.1
Metropolitan Life Insurance Co., industrial policy holders (January-September): [2]																								
1940	7.8	------	------	------	.7	------	.6	1.3	.8	45.3	8.7	.4	------	------	102.7	29.3	61.5	[3] 161.0	38.2	------	[4] 4.4	[5] 57.2	46.7	[6] 15.8
1939	7.8	------	------	------	.7	------	.8	1.8	1.1	45.9	11.1	.7	------	------	100.3	28.0	60.1	[3] 162.0	46.6	------	[4] 5.5	[5] 52.0	46.2	[6] 16.1
1938	7.7	------	------	------	1.0	------	1.2	2.2	1.4	47.6	7.4	2.0	------	------	95.5	24.4	57.6	[3] 151.9	53.1	------	[4] 7.3	[5] 53.1	48.3	[6] 16.9

Alaska:																								
1940	18.4	24.1	128	2.3	(7)	1.8	(7)	29.2	5.5	365.0	14.6	178.8	(7)	(7)	71.2	3.6	85.8	219.0	175.2	29.2	3.6	20.1	142.3	(7)
1939	15.0	16.7	99	3.7	(7)	(7)	11.1	27.5	1.8	341.0	24.0	3.7	(7)	1.8	75.6	3.7	59.0	213.8	132.7	40.6	(7)	29.5	143.8	(7)
1938	19.9	26.5	87	0.7	1.9	(7)	1.9	71.4	3.8	448.8	46.9	1.9	1.9	(7)	69.5	(7)	139.0	244.1	227.2	30.4	(7)	15.0	189.7	(7)
Colorado:																								
1940	10.9	19.0	52	4.1	.6	.4	.4	3.0	1.3	51.6	12.5	1.5	1.3	.7	120.3	17.7	86.6	256.0	71.0	70.9	10.1	70.1	87.6	31.4
1939	11.2	18.5	46	4.6	1.9	.8	1.1	5.6	3.0	55.9	21.8	1.6	.8	.5	116.3	17.0	88.2	237.7	86.2	65.4	9.9	76.3	87.0	25.5
1938	11.2	18.4	53	4.6	1.6	.6	1.0	3.9	3.3	61.5	13.3	3.6	.6	1.8	112.6	17.1	87.1	231.1	92.0	70.0	12.8	81.6	90.1	29.9
Connecticut:																								
1940	9.8	12.3	39	3.2	.3	.4	(7)	.3	.2	32.8	5.2	.2	.1	.2	142.5	22.2	106.1	304.2	42.5	45.2	2.1	56.8	54.4	16.6
1939	10.0	12.9	37	3.2	.4	.1	.2	1.3	.4	35.5	5.8	.6	.1	.2	140.0	29.0	83.5	281.5	47.0	48.0	2.2	77.4	58.0	16.4
1938	10.3	13.9	36	2.8	.6	.2	.3	.6	.7	36.0	4.3	(7)	(7)	.2	143.6	29.3	88.6	253.5	54.1	50.8	3.3	81.4	73.0	18.2
Delaware:																								
1940	12.4	16.9	51	4.4	1.0	1.0	1.5	2.5	(7)	49.5	12.5	(7)	.5	(7)	151.0	31.5	105.5	355.9	59.0	52.5	4.0	139.0	72.5	33.2
1939	12.1	16.4	46	4.6	2.0	2.0	.5	3.0	1.0	60.7	12.6	(7)	(7)	1.5	115.8	33.9	112.3	368.6	74.3	54.6	6.1	111.3	74.8	33.4
1938	12.2	15.8	53	6.2	.5	.5	.5	6.6	1.0	49.1	11.8	1.0	(7)	(7)	126.2	30.7	102.7	364.9	73.6	61.8	9.7	108.5	81.8	27.6
District of Columbia:																								
1940	12.9	22.3	45	3.0	1.0	.8	.2	1.8	.4	66.8	7.8	(7)	.4	.8	148.9	34.2	92.7	339.2	81.2	81.0	9.8	117.9	70.6	20.4
1939	12.7	21.6	47	5.1	.2	.8	(7)	2.1	.6	69.1	10.7	.4	(7)	.2	156.2	26.1	78.4	332.3	73.7	80.9	11.7	105.3	75.1	21.8
1938	12.6	20.2	49	5.2	.8	1.7	.6	.6	.8	74.2	5.1	.4	.4	.6	138.9	23.3	84.0	335.0	89.7	76.6	12.3	102.1	67.5	20.7
Florida:																								
1940	12.1	16.4	56	7.0	1.2	.4	.1	1.8	1.0	51.8	31.9	.4	.3	.3	95.7	19.2	112.0	293.4	57.8	68.6	7.1	90.4	93.9	34.2
1939	11.1	16.1	59	6.6	1.4	.6	.2	3.4	1.6	49.0	23.3	.9	.4	.2	91.2	19.4	92.2	235.3	52.6	77.2	11.8	90.8	89.5	34.5
1938	11.4	15.9	59	7.7	3.1	1.0	.1	4.0	1.8	53.7	20.4	1.8	.7	.6	83.9	17.9	91.4	282.7	64.0	83.6	12.8	89.2	91.6	36.5
Georgia:																								
1940	10.0	19.8	59	5.3	2.0	.3	.5	2.9	1.5	48.5	33.8	.9	.2	(7)	60.5	10.9	93.1	192.3	66.5	49.0	13.3	102.5	59.6	20.7
1939	9.6	19.4	62	5.8	2.7	.4	.4	4.2	1.9	46.9	29.6	2.1	.4	.1	60.0	11.4	90.3	162.9	67.9	59.2	14.8	90.0	53.7	18.5
1938	10.6	19.9	70	6.7	4.5	.8	.3	7.9	2.3	51.8	24.4	6.1	.6	.3	60.3	12.7	84.7	164.8	82.4	73.9	24.3	111.4	64.2	23.7
Idaho:																								
1940	9.0	22.5	36	3.4	.8	1.0	.8	1.8	.3	18.0	13.2	1.3	.8	1.0	88.3	17.5	57.4	232.5	31.5	56.4	5.8	54.8	102.8	36.8
1939	9.2	21.6	45	2.5	3.1	1.5	.5	2.3	1.0	18.8	15.5	1.0	.5	1.5	89.0	21.2	61.9	240.2	59.1	54.2	4.4	49.8	95.2	30.7
1938	8.8	22.5	42	3.6	1.8	1.8	.8	3.4	.5	20.4	16.2	.8	.3	1.3	81.8	13.1	63.4	180.8	73.1	55.8	3.7	55.3	84.9	31.7
Illinois:																								
1940	11.2	15.2	36	3.0	.5	.2	1.0	.7	1.1	47.1	9.0	.2	.4	.4	141.5	33.5	82.9	352.7	47.6	60.0	2.5	92.6	72.1	27.3
1939	11.1	14.7	39	3.1	1.4	.2	1.0	2.2	1.5	47.6	14.7	.1	.3	.3	140.8	29.7	74.3	338.1	56.7	61.8	3.3	94.4	66.6	24.4
1938	10.6	15.3	41	3.3	.7	.3	1.8	1.7	1.4	46.8	5.3	3.5	.2	.4	135.6	27.5	72.6	308.9	55.8	65.1	6.2	91.8	72.2	24.1
Indiana:																								
1940	11.5	16.6	42	3.0	.8	.2	1.2	2.6	.9	38.9	24.7	.1	2.3	.5	121.5	15.4	143.8	310.7	58.6	(8)	3.3	79.3	79.5	29.8
1939	11.2	15.8	42	4.1	1.3	.4	1.5	1.8	1.4	41.9	31.1	.2	.2	.5	113.5	16.6	131.5	250.1	73.9	(8)	5.8	63.1	72.1	27.4
1938	10.8	16.3	43	4.2	.7	.8	1.9	1.7	1.9	40.4	11.8	4.1	.3	.6	113.5	16.3	120.4	235.6	66.6	(8)	8.9	64.8	73.5	29.7
Iowa:																								
1940	10.0	15.8	38	3.7	.4	.6	.7	.9	.6	17.0	18.9	.5	2.1	.8	130.4	26.2	107.0	287.2	48.6	51.3	1.9	65.6	63.1	18.7
1939	10.1	17.1	37	2.4	.7	.5	1.1	1.8	.5	18.8	29.3	1.4	.5	.6	124.9	25.5	103.1	268.9	54.2	56.9	2.4	54.6	65.6	18.7
1938	9.5	16.5	37	3.3	.6	.7	2.2	2.8	.8	19.4	12.1	1.3	.5	1.1	126.9	21.4	97.7	240.2	57.3	57.2	3.6	56.4	64.2	16.6
Kansas:																								
1940	10.5	15.7	38	4.1	.6	.6	.5	1.6	.7	25.1	21.5	1.1	2.2	1.0	123.2	26.0	101.8	276.5	35.7	57.9	4.1	101.4	77.1	25.5
1939	10.3	15.8	40	4.0	.7	.4	.7	.6	.4	23.0	19.3	.1	.2	1.4	123.6	27.0	97.7	256.9	46.1	61.7	4.2	98.8	102.6	21.6
1938	10.1	16.0	42	4.1	.9	.4	1.5	3.2	.5	23.9	16.0	1.7	(7)	1.0	122.4	24.1	97.7	232.6	49.3	63.3	5.2	97.3	102.8	23.1

Provisional mortality from certain causes in the first 9 months of 1940, with comparative provisional data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis (under 2 years) (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
35 STATES—continued																								
Kentucky:																								
1940	10.3	20.8	52	4.0	2.3	1.1	.8	4.6	1.5	67.2	30.2	.6	1.4	.5	83.6	13.9	106.4	215.3	59.5	58.0	12.0	72.5	76.8	23.3
1939	9.9	20.6	49	4.2	4.0	1.3	1.0	1.8	2.2	64.9	36.8	1.4	.7	.7	77.0	12.3	97.3	206.4	68.0	65.9	19.5	64.1	71.1	20.3
1938	9.6	23.4	51	4.0	4.0	2.3	1.4	7.7	2.6	70.3	23.4	5.0	.9	.2	71.4	13.3	97.0	185.8	69.8	84.3	34.3	70.6	59.2	20.7
Louisiana:																								
1940	11.1	20.6	64	5.8	3.9	.6	.1	7.2	1.4	60.5	34.0	.7	.7	.2	87.4	19.0	69.6	251.6	78.1	64.0	14.0	87.2	68.8	21.4
1939	10.3	19.7	62	6.1	6.6	.5	.2	4.8	2.2	60.2	24.8	5.3	.5	.3	75.8	16.0	67.8	210.3	80.6	68.5	13.3	91.9	60.1	17.5
1938	10.4	20.0	66	6.4	5.4	1.0	.3	4.3	2.4	63.3	22.9	.7	.3	.5	80.5	16.2	61.4	194.3	83.2	72.2	17.0	92.7	63.5	18.5
Maine:																								
1940	12.0	17.5	53	4.1	.6	1.3	.9	2.0	.8	28.2	12.3	1.4	.3	.3	146.7	29.8	124.4	356.6	50.9	53.5	5.0	87.7	70.8	20.9
1939	12.8	17.9	52	4.0	1.3	.2	.3	3.3	2.5	33.9	22.5	.6	1.0	.5	150.1	26.2	128.7	381.1	78.6	53.6	5.5	79.7	71.8	20.9
1938	12.2	18.2	49	4.3	1.9	(7)	(7)	2.4	1.4	30.5	16.4	2.1	.6	.2	147.8	27.9	115.3	340.3	74.8	59.2	8.8	85.0	64.7	19.3
Maryland:																								
1940	12.3	16.6	49	2.7	.5	.4	.4	3.4	.3	82.9	9.7	.1	.3	.4	139.0	31.7	97.7	351.7	66.6	50.0	5.3	131.4	76.4	24.2
1939	11.6	15.8	49	3.2	1.0	.7	.1	1.1	1.0	73.6	10.4	1.2	.1	.4	132.1	27.9	94.2	312.2	70.1	53.6	7.7	116.8	69.4	21.0
1938	11.6	16.4	57	3.8	1.6	.9	.6	3.1	.7	74.5	7.6	.6	.1	1.0	127.0	27.3	94.7	301.0	76.4	59.4	11.7	123.0	68.1	20.2
Massachusetts:																								
1940	11.7	(9)	(9)	(9)	.3	.2	.2	.3	.2	38.9	3.4	.3	(9)	.3	171.1	36.3	103.9	414.4	60.0	53.3	2.3	71.5	60.9	13.8
1939	11.4	(9)	(9)	(9)	.4	.5	.4	1.3	.2	37.2	6.3	.5	(9)	.2	157.4	35.5	101.4	402.0	74.9	54.6	2.1	65.1	59.1	12.8
1938	11.3	(9)	(9)	(9)	.3	.6	.7	.9	.3	39.0	3.8	.3	.3	.2	159.2	33.1	98.8	369.8	76.7	56.2	2.7	70.3	60.8	14.2
Michigan:																								
1940	9.8	18.5	41	3.3	.2	.2	.9	1.0	.4	34.8	5.0	.4	1.3	.3	116.9	27.0	91.4	293.1	44.6	53.7	3.5	54.9	73.4	29.9
1939	10.0	18.0	42	3.1	.5	.3	1.6	1.6	.5	36.9	18.1	.7	.8	.2	115.3	26.0	82.2	284.7	56.0	56.9	4.8	54.3	70.2	23.6
1938	9.6	18.6	44	3.6	.5	.4	1.8	2.4	.7	37.8	5.9	2.5	.2	.2	109.5	24.3	82.9	281.3	53.0	58.5	6.3	52.1	66.6	24.1

Minnesota:																							
1940	9.5	18.7	33	2.4	.2	.2	.6	1.1	.2	27.4	9.5	.2	.7	.6	133.1	26.4	89.3	272.3	57.9	50.4	2.3	38.8	66.6	20.6
1939	9.6	17.8	37	2.7	.1	.2	[illegible]	.7	.4	30.4	14.3	3.1	1.4	.4	135.1	25.7	91.1	251.7	60.0	55.6	3.6	38.6	66.9	18.8
1938	9.2	17.3	35	3.2	.3	.3	1.1	2.2	.4	28.2	8.1	.7	.3	.7	136.0	24.0	82.4	229.1	61.0	52.6	3.0	40.8	67.7	22.5
Mississippi:																							
1940	10.4	(9)	(9)	(9)	1.6	.8	.1	6.4	1.9	46.2	43.9	.3	.7	.5	62.1	13.3	71.9	155.7	45.7	60.9	16.1	102.3	71.2	17.6
1939	10.1	(9)	(9)	(9)	2.3	1.2	.1	7.2	2.0	50.3	41.6	4.7	.8	.3	60.9	12.1	71.6	155.9	56.4	62.0	15.6	90.7	57.0	17.6
Montana:																							
1940	10.0	20.4	43	3.3	.7	1.0	2.1	.7	1.0	41.3	12.6	1.2	1.0	2.1	111.2	10.5	97.6	230.4	47.5	71.8	6.4	56.8	90.2	24.1
1939	10.6	19.5	52	3.4	2.4	1.2	1.0	3.6	1.2	44.8	21.6	3.8	(7)	1.2	116.2	19.2	89.9	226.7	67.8	65.9	4.8	55.8	94.2	25.9
1938	10.2	19.3	42	3.6	.7	1.9	1.9	3.9	1.9	43.6	20.7	1.4	.2	5.5	95.3	15.6	86.1	208.6	75.1	66.2	6.0	50.5	101.3	23.3
Nebraska:																							
1940	9.7	16.7	35	3.1	.4	.3	.9	.4	.6	18.3	20.8	.4	.8	.5	127.6	26.9	106.2	238.6	46.8	54.4	2.6	65.2	65.6	17.4
1939	9.3	16.5	34	3.4	.5	.2	1.0	1.3	.9	17.2	19.5	1.4	.4	.4	116.0	25.0	91.0	206.1	56.2	57.1	2.2	67.7	72.2	21.0
1938	9.0	16.5	37	3.3	.5	.5	1.3	2.7	.9	17.2	11.3	.9	.4	.8	123.6	25.2	85.3	223.1	54.2	51.6	2.6	61.7	58.8	17.6
Nevada:																							
1940	12.0	19.0	47	5.1	(7)	1.2	(7)	3.6	1.2	68.8	7.2	(7)	1.2	(7)	111.0	20.5	66.3	304.0	65.1	71.2	3.6	57.9	160.4	70.0
1939	11.1	17.0	43	5.1	1.2	1.2	(7)	(7)	(7)	50.4	6.1	2.5	(7)	(7)	102.0	9.8	71.3	265.4	87.2	38.1	4.9	41.8	195.4	68.8
1938	11.3	16.9	36	2.2	3.8	(7)	(7)	1.3	3.8	67.5	1.3	(7)	(7)	(7)	90.1	12.5	71.3	263.9	96.3	60.0	5.0	72.5	126.8	55.0
New Jersey:																							
1940	10.9	14.2	36	2.8	.4	.1	.5	.5	.5	43.8	4.8	.3	.1	.4	143.8	36.7	90.7	360.3	46.3	54.7	2.3	78.1	63.1	19.5
1939	10.5	13.8	39	3.0	.4	.4	.5	1.3	.5	45.0	6.8	(7)	.7	.6	137.8	33.4	85.2	352.0	49.6	56.4	2.8	68.3	56.8	18.3
1938	10.5	13.7	39	3.4	.4	.5	.3	1.2	.8	48.0	5.0	1.0	.2	.7	132.1	29.9	83.5	332.2	59.6	60.0	3.2	73.0	61.1	20.5
New Mexico:																							
1940	10.6	31.0	88	4.7	2.2	.5	.2	10.2	1.5	74.7	12.5	1.0	.5	(7)	56.2	10.2	42.0	116.5	52.0	87.2	42.7	49.5	89.7	40.7
1939	11.0	30.0	98	4.3	2.8	1.3	.5	7.1	3.6	71.5	24.3	1.0	1.3	(7)	53.1	7.9	38.6	107.2	87.6	84.8	36.0	48.5	82.5	36.0
1938	10.8	29.2	93	4.9	3.1	.5	.8	14.3	2.6	75.3	11.7	13.0	.8	(7)	54.7	6.0	41.7	110.5	70.4	93.9	39.9	52.9	77.2	27.6
New York:																							
1940	10.9	14.7	37	3.1	.2	.4	.3	1.1	.1	47.7	3.3	.1	.1	.9	157.0	40.6	72.5	385.5	47.0	58.0	3.0	66.2	61.5	16.5
1939	11.3	14.3	39	3.0	.4	.5	.4	.9	.3	49.0	4.7	.5	.3	.5	152.9	39.8	66.3	365.0	59.5	60.8	4.5	67.7	60.8	16.0
1938	11.0	14.4	41	3.8	.4	.6	.6	1.4	.3	50.3	3.6	.9	.2	.7	149.9	35.4	62.8	350.9	64.1	61.1	5.1	70.3	62.8	17.0
North Carolina:																							
1940	9.1	22.5	58	5.7	1.1	.3	.3	2.1	2.5	50.5	25.9	.4	.4	.4	57.7	14.0	85.4	153.4	61.2	52.4	12.9	97.6	61.5	23.4
1939	8.9	22.4	59	5.2	1.4	.5	.4	7.4	2.6	51.1	19.4	2.2	.2	.2	54.8	13.0	79.9	157.9	60.9	64.9	20.2	81.1	61.4	23.6
1938	9.7	22.8	68	6.1	2.3	.9	.5	8.4	3.6	55.4	14.0	9.1	.3	.4	54.8	10.6	79.3	162.2	76.6	80.3	33.1	90.2	61.3	22.6
North Dakota:																							
1940	7.9	21.1	39	1.5	.6	(7)	1.0	1.9	1.7	19.6	10.2	.2	.2	1.7	97.5	23.3	70.6	206.7	39.2	51.9	5.4	41.3	53.6	17.1
1939	7.8	20.9	45	2.7	.8	.6	1.0	2.1	.8	21.4	21.6	4.1	(7)	.8	86.0	20.9	70.7	192.0	55.8	48.9	6.2	39.0	43.5	11.8
1938	8.0	20.5	47	2.5	.2	1.6	3.3	10.1	.8	23.3	10.7	3.1	(7)	5.2	98.1	22.3	65.9	156.8	55.0	55.6	6.6	43.9	52.8	17.3
Ohio																							
1940	11.4	16.5	38	3.6	.8	.4	.7	1.7	.4	40.6	15.0	(7)	.6	.5	136.1	30.9	112.7	316.2	54.5	54.2	4.2	78.1	86.9	27.0
1939	11.2	15.5	42	3.8	.7	.2	1.1	1.3	.8	43.3	21.7	.1	.2	.6	131.4	28.4	107.9	295.8	62.1	56.3	5.2	76.8	80.8	24.9
1938	10.8	16.5	44	3.9	.8	.7	1.3	2.0	1.1	47.6	11.2	3.4	.2	.4	127.1	26.6	102.0	270.5	60.0	59.6	7.0	74.3	77.4	25.1
Oklahoma:																							
1940	8.7	18.7	47	3.6	2.4	1.1	.3	2.1	2.2	47.4	23.6	.2	1.5	.7	81.9	14.2	80.6	161.6	55.5	59.7	10.0	62.5	56.1	18.8
1939	9.1	18.6	55	4.4	4.1	.5	.9	1.2	2.5	46.6	23.8	4.3	.4	.6	78.3	13.9	87.1	155.2	65.6	64.7	10.1	58.1	87.6	21.3
1938	8.7	19.2	42	4.2	4.4	1.1	.7	9.5	4.4	49.6	18.1	2.8	1.3	.3	76.4	13.6	70.2	139.7	61.8	63.5	10.5	63.6	72.4	22.6
Pennsylvania:																							
1940	11.0	16.3	43	2.7	.6	.7	.5	1.2	.4	40.5	12.2	.1	.3	.6	124.2	35.6	84.6	336.5	51.1	54.9	3.7	96.6	56.5	15.3
1939	10.7	16.5	44	3.3	.6	.6	.6	1.6	.6	41.3	14.0	.1	.4	.7	124.2	33.8	82.9	321.6	52.3	53.4	4.7	84.4	52.9	14.2
1938	10.8	17.0	46	3.6	.9	.7	1.3	1.7	.8	42.6	10.4	3.1	.1	.7	121.0	30.8	82.1	306.3	61.8	58.0	5.7	82.6	58.6	15.9

See footnotes at end of table.

Provisional mortality from certain causes in the first 9 months of 1940, with comparative provisional data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis (under 2 years) (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
35 STATES—continued																								
Rhode Island:																								
1940	11.2	15.2	38	2.5	1.3	.9	(7)	.4	.4	32.9	4.3	.6	.4	.2	160.3	38.7	99.5	368.7	54.6	54.8	1.9	96.0	49.2	10.9
1939	10.9	14.6	39	3.2	(7)	.4	(7)	2.6	.2	39.7	6.4	.2	(7)	(7)	152.2	32.3	85.9	354.8	62.2	61.5	4.3	95.5	49.1	10.1
1938	11.8	15.2	41	2.1	.4	.9	.4	1.3	.2	40.6	4.9	(7)	.2	.8	153.5	39.6	93.2	340.7	85.4	58.3	3.8	105.3	100.9	11.3
South Carolina:																								
1940	10.7	21.6	73	6.8	3.8	.4	.1	2.2	2.0	47.8	39.2	.8	.6	.3	56.4	12.8	102.6	205.5	68.1	53.8	7.4	93.6	73.7	28.2
1939	9.6	20.1	71	6.1	5.3	.4	.1	7.7	2.3	42.7	26.9	.6	2.8	.2	50.5	12.6	90.4	178.2	61.8	42.9	7.7	84.4	60.5	23.5
1938	10.7	20.3	86	8.2	6.4	.7	.5	15.4	1.9	48.8	30.4	9.9	.6	.4	52.4	11.9	90.4	182.6	82.9	43.1	13.2	87.9	60.1	22.3
Tennessee:																								
1940	10.2	17.8	56	5.4	2.1	.6	.5	3.6	1.1	74.9	35.8	.8	.1	.6	71.8	14.2	85.0	195.4	75.1	60.7	10.6	61.6	62.7	16.2
1939	9.6	16.9	55	5.5	3.0	.6	.6	3.3	1.6	79.2	36.3	1.5	.6	.7	69.8	12.6	79.8	169.3	69.0	66.7	13.7	58.9	60.0	17.3
1938	9.7	17.1	66	5.8	3.6	1.5	.4	7.4	2.6	77.4	25.4	9.1	.7	.6	69.1	10.4	78.0	160.7	76.3	78.5	23.9	62.6	60.0	18.4
Texas:																								
1940	9.5	(9)	(9)	(9)	3.5	.4	.2	4.3	2.0	58.2	28.2	4.1	.6	.5	74.9	14.1	62.2	179.4	54.7	88.2	34.5	56.6	66.1	24.4
1939	8.8	(9)	(9)	(9)	4.6	.3	.3	4.1	2.2	58.3	23.6	1.6	1.1	.3	66.8	12.0	60.8	163.0	57.5	(9)	29.1	53.1	61.8	21.9
Utah:																								
1940	8.5	24.5	37	2.8	.5	.5	1.5	2.4	(7)	15.0	12.8	1.0	1.2	.5	90.6	18.9	58.4	236.2	35.1	53.8	3.4	47.5	81.4	32.9
1939	8.2	23.1	39	3.2	.5	.7	.2	1.0	.5	15.6	8.8	.2	.5	1.0	93.1	17.1	53.8	227.3	43.5	52.3	1.7	53.0	72.8	28.3
1938	8.6	24.5	42	3.7	.5	1.7	1.2	3.7	1.5	21.2	9.6	2.5	(7)	.2	83.7	18.0	49.3	218.7	55.4	58.1	2.2	49.7	89.9	34.2
Vermont:																								
1940	11.1	18.3	32	3.9	1.1	.7	(7)	2.2	(7)	36.6	12.3	(7)	.4	(7)	136.3	24.7	117.3	318.6	65.7	51.9	6.0	75.8	55.3	16.4
1939	11.7	15.8	36	3.3	(7)	.4	1.1	7.1	1.1	40.7	28.4	1.1	1.1	.4	143.9	31.8	116.2	372.9	85.6	51.9	3.4	80.7	68.0	19.1
1938	11.2	16.0	42	3.0	.4	(7)	.4	3.4	4.9	38.8	14.2	4.5	1.5	.4	127.0	28.4	107.6	313.7	84.8	55.3	2.6	83.3	65.7	20.5

Virginia:																								
1940	11.1	19.8	59	4.7	.9	1.3	.3	4.0	1.7	60.4	29.3	1.0	.6	.8	80.4	20.5	101.8	251.3	72.1	48.7	8.6	106.8	82.1	28.2
1939	10.6	19.3	63	5.1	1.7	1.0	.3	6.0	2.7	62.3	24.2	1.1	.3	.3	79.2	17.2	102.6	241.7	67.0	53.3	11.2	86.4	70.6	27.2
1938	10.8	19.6	72	5.2	2.3	1.7	.3	7.9	2.5	69.6	18.7	4.5	.4	.2	78.7	16.0	94.9	230.7	69.5	62.0	18.5	82.3	68.7	23.0
West Virginia:																								
1940	8.9	20.2	52	4.5	1.8	1.5	.9	5.3	2.0	46.2	19.9	(7)	1.6	.4	72.8	16.4	77.4	167.2	53.2	42.9	6.1	66.1	83.5	18.2
1939	9.0	20.3	55	3.6	3.1	2.1	.9	2.1	2.0	45.4	21.3	.4	.3	.7	73.0	16.1	76.5	168.4	61.6	60.3	16.0	65.0	72.6	16.1
1938	9.2	21.3	64	3.7	3.4	2.0	1.7	8.9	2.0	50.2	20.2	8.0	.9	.6	72.0	15.4	68.9	161.3	69.9	70.0	24.9	68.1	73.4	18.1
Wisconsin:																								
1940	10.1	17.4	37	2.8	.2	.2	.9	.9	.2	25.8	13.4	.4	1.0	.8	134.7	28.5	96.2	299.2	49.1	(9)	3.3	57.7	76.6	23.0
1939	10.2	17.2	42	2.8	.2	.3	1.1	1.6	.1	27.7	21.0	.9	.4	.2	127.3	27.3	87.1	301.2	51.0	(9)	4.7	58.4	74.2	21.0
1938	9.7	17.5	42	2.9	.2	.3	1.2	1.7	.4	29.3	6.5	1.5	.2	.3	129.7	27.5	83.4	270.6	82.1	(9)	4.8	60.1	65.5	19.6
Wyoming:																								
1940	8.2	19.5	42	4.4	.5	2.7	.5	.5	1.6	14.9	5.8	3.2	.5	1.1	83.4	13.8	68.0	192.4	32.4	52.6	3.2	54.7	103.2	52.1
1939	8.9	19.5	49	4.1	2.7	1.1	(7)	.5	1.1	23.6	12.9	.5	.5	(7)	79.0	12.4	58.6	211.1	46.7	65.0	4.3	67.2	106.4	42.4
1938	8.9	19.2	54	3.7	2.2	1.1	.5	15.7	1.6	24.4	15.7	(7)	(7)	.5	82.0	11.4	58.1	193.8	65.7	65.7	8.1	56.4	112.3	37.4

[1] Includes all States except Michigan, Nebraska, and Rhode Island, with data for the 9-month period of 1940, 1939, and 1938. The District of Columbia is included as a State. Estimated population July 1, 1940, 98,175,700

[2] These data are taken from the October 1938, 1939, and 1940 Statistical Bulletins published by the Metropolitan Life Insurance Co. All figures are provisional and are subject to correction, since they are based on provisional estimates of lives exposed to risk. Data do not include all diseases reported to the Public Health Service.

[3] Excludes pericarditis, acute endocarditis, and acute myocarditis.

[4] Classified as diarrhea and enteritis, age not specified.

[5] Chronic nephritis only

[6] Excludes collisions between automobiles and trains or street cars.

[7] No deaths reported

[8] Less than 0.1 per 100,000 population.

[9] Data not available.

U. S. PUBLIC HEALTH SERVICE ORIENTATION COURSE FOR PERSONNEL TO SERVE IN HEALTH AND SANITATION ACTIVITIES IN CONNECTION WITH NATIONAL DEFENSE

The Surgeon General of the U. S. Public Health Service is now setting in motion a plan for inducting into the Service as rapidly as possible approximately 250 public health workers, in order to deal with the emergency public health and sanitation problems in and around cantonment areas.

Plans have been completed for carrying on an orientation course for doctors, nurses, engineers, and laboratory workers at the National Institute of Health, Bethesda, Md., beginning April 7, 1941.

The national defense emergency makes it necessary for the Public Health Service to mobilize immediately a corps of public health workers to augment State and local health services in areas where defense activities have created unusual health and sanitation problems.

The Surgeon General has assigned from the Public Health Service Senior Surgeon Mark V. Ziegler as the Director of the orientation course with Miss Mary J. Dunn, Nursing Consultant, and Ellis S. Tisdale, Sanitary Engineer (R), to assist with the nursing and engineering aspects of the work.

Headquarters for the staff have been established in the Administration Building, National Institute of Health, Bethesda, Md.

The course will start April 7, 1941. It will consist of two parts, classroom instruction for 3 weeks, and field observation and practical application activities for about 2 weeks. The field work will be in a restricted area in Maryland. The Demonstration Defense Area will include facilities for demonstrating public health practices and methods in respect to:

1. Communicable disease control, emphasizing the prevention of the spread of venereal diseases.
2. Public health administration as it relates to defense activities.
3. Environmental sanitation.
4. Industrial hygiene in respect to the production of defense materials.

Surgeon L. B. Byington has been assigned to organize and direct the field activities in the demonstration area.

An advisory council consisting of the following persons has been appointed by the Surgeon General to assist in guiding this orientation course.

Dr. Milton J. Rosenau, University of North Carolina.
Dr. Harry S. Mustard, Columbia University.
Dr. John Sundwall, University of Michigan.
Dr. W. L. Leathers, Vanderbilt University.
Dr. Gaylord Anderson, University of Minnesota.
Dr. Cecil K. Drinker, Harvard University.
Dr. Abel Wolman, Johns Hopkins University.

Dr. Ira V. Hiscock, Yale University.
Lt. Col. Arthur P. Hitchins, University of Pennsylvania.
Miss Katharine Tucker, University of Pennsylvania.

SUMMARY OF SYMPOSIUM ON ALCOHOLISM AVAILABLE

The April issue of Mental Hygiene will carry a brief report on the 3-day symposium conducted by the Research Council on Problems of Alcohol at Philadelphia, December 27–29, 1940. The symposium was part of the annual meeting of the American Association for the Advancement of Science.

Reprints of the report are now available from Mental Hygiene at nominal cost.

The report in Mental Hygiene discusses papers by Donald S. Berry, Dr. Norman Joliffe, Dr. Harold D. Palmer, Dr. Karl Bowman, Dr. Abraham Myerson, Dr. Jeremiah P. Shalloo, Dr. George S. Stevenson, Surgeon General Thomas Parran, and others.

The symposium was an approach to scientific description and control of individual and social problems of alcoholism.

MERCURIALISM AND ITS CONTROL IN THE FELT-HAT INDUSTRY[1]

Findings of the study of mercurialism in the felt-hat industry, conducted by the Public Health Service in cooperation with the Connecticut State Department of Health in 1940, are reported in Public Health Bulletin No. 263.

Fifty-nine cases of chronic mercurialism were found on medical examination of 534 hatters employed in five representative felt-hat factories. Four of the 21 men engaged in mixing and blowing, 8 of the 34 coners, 6 of the 29 hardeners, and 33 of the 179 starters, wetters-down, and sizers were so diagnosed. Mixers and blowers were exposed to 5 mg. Hg per 10 m.^{3} of air, hardeners to 2.7, and starters, wetters-down, and sizers to 2.1 mg. Hg per 10 m.^{3} of air. In any range of exposure above 1.0 mg. Hg per 10 m.^{3} the incidence of mercurialism increased with increasing duration of employment. No cases were found among hatters exposed to less than 1.0 mg. Hg per 10 m.^{3} of air, as measured by the Nordlander instrument.

Chronic mercurialism is characterized by fine intention tremor; psychic irritability of an exaggerated degree; dermographia, excessive perspiration, and abnormal readiness to blush; exaggerated tendon reflexes; pallor; and certain abnormalities of the mouth. Workers

[1] Mercurialism and its control in the felt-hat industry. Public Health Bulletin No. 263. Government Printing Office, Washington, 1941. Available from the Superintendent of Documents, Government Printing Office, at 15 cents per copy.

with mercurialism were found to excrete slightly less mercury in the urine than similarly exposed but nonaffected workers. Workers with elevated systolic blood pressure and albuminuria tended to excrete less mercury in the urine than similarly exposed workers who were normal in these respects.

The most direct means of preventing the occurrence of mercurialism among hatters is to substitute a nontoxic carroting agent for mercury. Until this is practicable, control of the mercury hazard depends on coordinated general and local exhaust ventilation so arranged and maintained as to prevent the escape of mercury into the breathing zone of workers, and upon enclosure or segregation of fur storage rooms, blowers, driers, and other sources of volatile mercury. Sketches of hoods and other enclosures, and specifications for air flow are presented.

Methods for quantitative chemical analysis of the mercury content of air, fur, tank water, etc., and for the quantitative spectrographic analysis of mercury in urine are described in detail.

COURT DECISION ON PUBLIC HEALTH

Statute regulating manufacture and distribution of confectionery products upheld.—(Washington Supreme Court; *Bauer et al.* v. *State et al.*, 110 P.2d 154; decided February 14, 1941.) A Washington statute, regulating the manufacture and distribution of candy and other confectionery products, excluded from its operation persons selling confections exclusively at retail in a fixed place of business. Another of the act's provisions was that no person should be permitted to work in a confectionery without holding a physician's certificate of health.

The plaintiffs, who were wholesale dealers in candy, instituted an action asking a declaratory judgment declaring the said law unconstitutional. As wholesale dealers the plaintiffs purchased candy from the manufacturer and sold it to retailers. They alleged that all of the candy in which they dealt was sold to them in boxes or cartons sealed with cellophane or wrapped in some other sanitary wrapping and that none of it was handled or sold by them in bulk or in any manner other than in the original containers in which it was received by them. They claimed that the act was unjustly discriminatory in that it affected them while exempting retail dealers who sold candy over the counter and who handled the candy in the course of arranging it for sale and selling it.

With reference to the plaintiffs' contention of denial of equal protection of the law in contravention of constitutional provisions, the Supreme Court of Washington quoted from one of its prior decisions in which it was said:

To comply with these constitutional provisions, legislation involving classifications must meet and satisfy two requirements: (1) The legislation must apply alike to all persons within the designated class; and (2) reasonable ground must exist for making a distinction between those who fall within the class and those who do not.

Within the limits of these restrictive rules, the Legislature has a wide measure of discretion, and its determination, when expressed in statutory enactment, cannot be successfully attacked unless it is manifestly arbitrary, unreasonable, inequitable, and unjust.

The court stated that the act in question in the instant case exempted no one within the designated class from its operation and could not be held unconstitutional because it applied to wholesalers or jobbers of confections and exempted from its operation persons selling such products at retail. It could be argued, said the court, that the latter class of persons should also be subject to statutory regulation but that was a matter within the legislative authority and it could not be held that the act was unconstitutional as containing a classification so unreasonable as to be beyond the power of the legislature.

The judgment of the lower court, which was adverse to the plaintiffs, was affirmed.

DEATHS DURING WEEK ENDED MARCH 15, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 15, 1941	Corresponding week, 1940
Data from 88 large cities of the United States.		
Total deaths	9,103	8,960
Average for 3 prior years	9,136	
Total deaths, first 11 weeks of year	105,855	105,008
Deaths under 1 year of age	521	428
Average for 3 prior years	516	
Deaths under 1 year of age, first 11 weeks of year	6,013	5,734
Data from industrial insurance companies:		
Policies in force	64,649,882	66,021,448
Number of death claims	12,836	13,652
Death claims per 1,000 policies in force, annual rate	10.4	10.8
Death claims per 1,000 policies, first 11 weeks of year, annual rate	10.9	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 22, 1941

Summary

The number of reported cases of measles increased from 43,060 for the preceding week to 47,421 for the current week, a figure higher than recorded for the corresponding week in 1938 (44,191), when the largest number of cases for that year was reported. The cumulative figure for the current year (12 weeks) to date, however, is below that for the corresponding period of 1938—269,782 cases as compared with 374,502.

The current incidence of measles continues predominantly highest in the East North Central and Middle Atlantic States, with the South Atlantic and East South Central next. The current annual case rate in the East North Central area is nearly twice that for the country as a whole and approximately five to six times that for the New England and Western States. The lowest current incidence is reported for the Pacific States, which recorded the largest number of cases for the corresponding period in both 1939 and 1940 but the lowest in 1938.

For the current week each of the 9 communicable diseases listed in the following table, with the exception of measles and poliomyelitis, was below the 5-year (1936–40) median expectancy. Only 38 cases of smallpox were reported (26 in the North Central States and 5 in Washington State), and 76 cases of typhoid fever. Of 20 cases of endemic typhus fever, 7 were reported in Texas and 6 in Georgia. One case of Rocky Mountain spotted fever was reported in Nevada, 1 case of tularemia in Mississippi, and 1 case of psittacosis in Florida.

The death rate for the current week for 93 major cities in the United States was 12.6 per 1,000 population, as compared with 12.7 for both last week (92 cities) and the 3-year (1938–40) average (88 cities).

Telegraphic morbidity reports from State health officers for the week ended March 22, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Mar. 22, 1941	Mar. 23, 1940		Mar. 22, 1941	Mar. 23, 1940		Mar. 22, 1941	Mar. 23, 1940		Mar. 22, 1941	Mar. 23, 1940	
NEW ENG.												
Maine	0	0	2	------	2	13	118	270	75	0	1	0
New Hampshire	0	0	0	3	------	------	89	93	11	0	0	0
Vermont	0	0	1	------	------	------	13	6	24	0	0	0
Massachusetts	1	3	3	------	------	------	700	386	782	4	0	4
Rhode Island	0	0	0	------	------	------	2	143	31	0	0	0
Connecticut	0	4	4	6	7	16	94	68	85	0	0	0
MID. ATL.												
New York [1]	19	19	34	[2] 32	[2] 28	[2] 32	7,892	479	1,615	[3] 3	5	8
New Jersey	10	2	10	29	11	12	2,772	167	193	2	1	1
Pennsylvania	21	13	30	------	------	------	5,149	149	333	4	5	6
E. NO. CEN.												
Ohio	6	4	16	68	14	13	7,691	9	238	1	0	4
Indiana	26	8	11	38	57	57	1,156	11	14	5	1	2
Illinois	17	23	33	53	16	47	4,159	104	81	1	3	3
Michigan [4]	1	2	10	19	1	6	3,275	289	245	0	5	4
Wisconsin	0	1	2	184	189	103	1,058	355	355	0	0	1
W. NO. CEN.												
Minnesota	0	0	2	3	2	2	12	214	214	0	1	1
Iowa	3	3	3	161	9	• 9	198	147	95	0	0	0
Missouri	9	3	12	201	8	144	384	6	26	3	0	2
North Dakota	0	2	1	8	62	6	27	3	5	0	0	0
South Dakota	0	1	0	1	2	------	3	2	2	0	0	0
Nebraska	2	2	2	11	------	------	9	15	85	0	0	1
Kansas	3	6	7	5	14	16	1,012	628	29	1	0	0
SO. ATL.												
Delaware	0	0	0	------	------	------	392	0	8	0	0	0
Maryland [4]	8	0	5	32	30	27	196	2	175	1	1	3
Dist. of Col.	2	13	13	2	2	2	287	1	37	1	1	1
Virginia	2	11	12	583	501	501	1,896	113	379	0	1	7
West Virginia [4]	6	6	10	72	229	165	360	12	19	2	7	5
North Carolina [1]	15	7	12	73	31	105	1,085	136	136	1	0	5
South Carolina	1	7	6	666	559	689	293	15	32	0	1	1
Georgia [1]	8	11	11	226	141	565	396	73	73	2	1	1
Florida [1] [5]	5	8	5	149	10	19	1,066	178	83	1	1	1
E. SO. CEN.												
Kentucky	3	6	8	90	38	79	1,111	137	137	3	5	5
Tennessee [1]	2	5	7	267	117	184	337	41	41	3	0	4
Alabama [1]	6	4	12	551	269	1,330	731	152	152	1	2	5
Mississippi [4]	3	7	6	------	------	------	------	------	------	1	0	0
W. SO. CEN.												
Arkansas	6	15	8	247	187	349	240	13	13	0	1	3
Louisiana [1]	3	8	11	7	14	64	120	0	9	3	2	2
Oklahoma	5	6	7	250	165	168	55	11	48	1	2	2
Texas [1]	30	32	38	1,361	1,277	1,166	1,416	800	418	1	1	5
MOUNTAIN												
Montana	2	13	1	2	4	7	9	20	60	0	1	0
Idaho	0	0	0	------	------	2	18	145	25	0	0	0
Wyoming	1	2	0	3	2	------	61	86	33	0	0	0
Colorado	5	9	9	18	23	------	266	19	19	0	0	0
New Mexico	1	0	4	15	11	1	143	14	54	1	1	2
Arizona	2	2	2	173	180	180	0	122	37	0	0	0
Utah [4]	1	2	2	22	15	1	13	718	127	1	0	0
Nevada [4]	0	------	------	6	------	------	10	------	------	0	------	------
PACIFIC												
Washington	5	1	1	8	------	16	89	1,026	278	1	0	0
Oregon	3	3	3	26	27	44	545	570	68	0	0	0
California	16	15	23	152	181	221	473	260	541	5	0	4
Total	259	289	404	5,823	4,438	6,359	47,421	8,208	10,885	53	50	75
12 weeks	3,492	4,668	6,360	562,145	144,942	100,056	269,782	67,982	91,882	[3] 570	478	1,084

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 22, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Mar. 22, 1941	Mar. 23, 1940		Mar. 22, 1941	Mar. 23, 1940		Mar. 22, 1941	Mar. 23, 1940		Mar. 22, 1941	Mar. 23, 1940	
NEW ENG.												
Maine	0	0	0	11	12	17	0	0	0	0	0	1
New Hampshire	0	0	0	2	1	4	0	0	0	1	0	0
Vermont	0	0	0	7	6	10	0	0	0	1	0	0
Massachusetts	1	0	0	153	141	269	0	0	0	0	0	1
Rhode Island	0	0	0	9	16	29	0	0	0	1	0	1
Connecticut	0	0	0	81	71	116	0	0	0	0	4	1
MID. ATL.												
New York [1]	[3] 0	0	0	553	1,190	1,028	0	0	0	1	3	8
New Jersey	0	0	0	381	390	225	0	0	0	0	3	1
Pennsylvania	0	1	1	371	377	522	0	0	0	5	3	7
E. NO. CEN.												
Ohio	0	1	1	319	225	339	1	5	5	3	3	3
Indiana	0	1	0	186	196	196	0	6	8	3	1	0
Illinois	0	0	2	520	833	779	7	2	19	1	4	4
Michigan [4]	0	3	0	155	287	508	2	1	12	0	5	2
Wisconsin	0	1	1	141	134	201	1	0	5	0	1	1
W. NO. CEN.												
Minnesota	1	0	0	47	82	160	3	5	7	0	0	0
Iowa	0	0	1	69	45	224	4	13	27	1	1	1
Missouri	0	0	0	228	47	211	6	8	22	2	3	3
North Dakota	3	0	0	3	16	22	2	1	4	0	1	0
South Dakota	1	0	0	24	18	18	0	4	4	0	1	0
Nebraska	0	0	0	27	15	41	0	0	7	0	0	0
Kansas	0	1	0	55	64	148	0	1	22	1	2	1
SO. ATL.												
Delaware	0	0	0	14	16	9	0	0	0	0	0	0
Maryland [4]	0	0	0	55	39	39	0	0	0	0	1	2
Dist. of Col	0	0	0	23	37	19	0	0	0	1	1	0
Virginia	0	1	0	43	40	30	0	0	0	3	4	4
West Virginia [4]	0	1	0	46	46	46	0	1	0	0	2	3
North Carolina [1]	0	0	0	25	39	39	0	0	0	0	2	2
South Carolina	0	0	0	8	1	4	1	0	0	3	0	2
Georgia [1]	0	1	1	15	18	18	0	0	0	3	1	2
Florida [1] [5]	6	0	0	8	15	8	0	0	0	6	2	2
E. SO. CEN.												
Kentucky	2	3	1	133	105	90	0	0	0	1	4	2
Tennessee [1]	0	0	0	105	93	37	1	0	0	1	2	2
Alabama [1]	1	0	1	16	9	11	1	1	1	2	2	2
Mississippi [4]	0	0	0	2	2	7	0	0	0	2	6	1
W. SO. CEN.												
Arkansas	0	2	1	6	6	10	0	3	3	3	0	0
Louisiana [1]	0	0	0	8	15	13	0	0	0	0	3	5
Oklahoma	2	2	1	30	20	24	0	1	2	5	1	1
Texas [1]	1	1	1	74	49	83	2	6	7	7	11	11
MOUNTAIN												
Montana	3	2	0	22	21	21	0	0	10	0	1	0
Idaho	0	0	0	5	3	15	1	0	2	0	0	0
Wyoming	0	0	0	9	7	16	1	1	0	1	1	1
Colorado	0	0	0	46	37	46	0	6	3	6	0	0
New Mexico	0	1	0	6	3	28	0	0	0	4	1	1
Arizona	0	2	0	5	13	13	0	0	0	1	0	0
Utah [4]	0	0	0	22	15	21	0	0	1	0	0	0
Nevada [6]	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	0	0	34	47	46	5	1	6	3	2	2
Oregon	1	1	1	6	18	43	0	2	14	1	4	2
California	2	3	0	177	138	202	0	4	14	3	3	2
Total	24	28	18	4,288	5,018	6,209	38	72	272	76	89	110
12 weeks	[3] 332	335	248	42,770	56,107	73,614	560	882	3,654	909	916	1,308

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 22, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough	
	Week ended—	
	Mar. 22, 1941	Mar. 23, 1940
NEW ENG.		
Maine	36	84
New Hampshire	3	15
Vermont	5	38
Massachusetts	189	104
Rhode Island	14	2
Connecticut	59	23
MID. ATL.		
New York [1]	294	382
New Jersey	93	65
Pennsylvania	373	263
E. NO. CEN.		
Ohio	307	76
Indiana	37	44
Illinois	86	114
Michigan [4]	199	129
Wisconsin	101	84
W. NO. CEN.		
Minnesota	74	22
Iowa	64	1
Missouri	90	27
North Dakota	17	1
South Dakota	10	2
Nebraska	32	4
Kansas	136	39
SO. ATL.		
Delaware	6	14
Maryland [4]	94	253
Dist. of Col.	7	14
Virginia	98	40
West Virginia [4]	46	27
North Carolina [1]	271	77
SO. ATL.—continued		
South Carolina	116	26
Georgia [1]	18	14
Florida [1, 5]	15	21
E. SO. CEN.		
Kentucky	74	53
Tennessee [1]	30	29
Alabama [1]	37	4
Mississippi [4]	-------	-------
W. SO. CEN.		
Arkansas	20	7
Louisiana [1]	13	1
Oklahoma	45	8
Texas [1]	233	255
MOUNTAIN		
Montana	31	2
Idaho	9	11
Wyoming	0	0
Colorado	85	6
New Mexico	15	12
Arizona	42	25
Utah [4]	86	200
Nevada [6]	0	-------
PACIFIC		
Washington	93	72
Oregon	18	39
California	465	205
Total	4,186	2,934
12 weeks	50,999	34,738

[1] Typhus fever, week ended Mar. 22, 1941, 22 cases, as follows: New York, 2; North Carolina, 2; Georgia, 6; Florida, 1; Tennessee, 1, Alabama, 2; Louisiana, 1; Texas, 7.

[2] New York City only.

[3] Information has recently been received that the weekly reports of meningococcus meningitis in the State of New York should include, in addition to the figures published, cases reported in New York City for 10 consecutive weeks ended Mar. 8, 1941, in order, as follows: 2, 3, 2, 2, 1, 3, 2, 1, 1, and 1; also, that the number of poliomyelitis cases in New York for the week ended Jan. 4, Public Health Reports, Jan. 10, 1941, p. 78, should be 2 instead of 11.

[4] Period ended earlier than Saturday.

[5] Psittacosis, week ended Mar. 22, 1941, Florida, 1 case.

[6] Rocky Mountain spotted fever, week ended Mar. 22, 1941, Nevada, 1 case.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 8, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities											
5 year average	134	806	129	5,725	890	2,154	27	390	21	1,141	--------
Current week [1]	63	461	63	15,164	495	1,260	0	308	23	1,201	--------
Maine:											
Portland	0	------	0	0	2	0	0	0	0	19	23
New Hampshire:											
Concord	0	------	0	0	0	0	0	1	0	0	10
Manchester	0	------	1	0	1	4	0	1	0	0	18
Nashua	0	------	0	0	0	0	0	0	0	7	5
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	1	0	0	0	0	0	0	0	6
Massachusetts:											
Boston	1	------	1	180	13	49	0	14	0	53	228
Fall River	0	------	0	0	0	6	0	0	0	3	28
Springfield	0	------	0	1	1	6	0	1	0	6	32
Worcester	0	------	0	74	4	6	0	2	0	4	59
Rhode Island:											
Pawtucket	0	------	0	0	0	1	0	0	0	0	14
Providence	0	1	0	0	2	3	0	2	0	12	61
Connecticut:											
Bridgeport	0	1	1	4	1	3	0	0	0	6	28
Hartford	1	------	0	1	1	0	0	1	0	8	43
New Haven	0	1	0	1	3	20	0	0	0	5	36
New York:											
Buffalo	0	------	2	30	14	25	0	6	1	18	168
New York	25	59	2	5,290	94	233	0	56	2	113	1,589
Rochester	0	------	0	22	2	4	0	1	0	17	72
Syracuse	0	------	0	0	2	1	0	2	0	30	80
New Jersey:											
Camden	1	------	0	20	3	10	0	0	0	7	26
Newark	0	9	1	257	8	34	0	5	0	2	118
Trenton	1	1	0	31	2	54	0	2	0	0	37
Pennsylvania:											
Philadelphia	2	7	3	1,399	42	90	0	19	2	52	522
Pittsburgh	4	2	1	61	11	11	0	8	0	52	177
Reading	0	------	0	282	0	3	0	2	0	2	23
Scranton	0	------	0	2	0	0	0	0	0	0	--------
Ohio:											
Cincinnati	2	------	2	191	5	23	0	5	0	3	126
Cleveland	0	21	2	2,527	5	37	0	6	0	92	181
Columbus	0	2	2	53	4	16	0	3	0	22	74
Toledo	0	------	0	36	5	1	0	9	0	5	95
Indiana:											
Anderson	0	------	0	0	4	0	0	1	0	0	16
Fort Wayne	0	------	0	34	2	2	0	0	0	0	23
Indianapolis	2	------	4	96	12	24	0	5	0	9	109
Muncie	0	------	0	6	2	20	0	0	1	0	7
South Bend	0	------	0	19	1	0	0	0	0	0	12
Terre Haute	0	------	0	3	2	0	0	0	0	0	12
Illinois:											
Alton	1	------	0	0	1	11	0	0	0	1	14
Chicago	2	10	3	1,798	37	171	0	40	1	39	715
Elgin	0	------	0	185	0	1	0	0	0	0	11
Moline	0	------	0	3	0	3	0	0	0	2	12
Springfield	1	------	0	9	1	7	0	0	0	5	20
Michigan:											
Detroit	4	7	3	1,264	16	131	0	17	0	124	312
Flint	0	------	0	79	3	3	0	1	0	8	22
Grand Rapids	1	------	0	196	3	7	0	0	0	6	41
Wisconsin:											
Kenosha	0	------	1	48	0	1	0	0	0	0	8
Madison	0	------	0	13	0	6	0	0	0	2	23
Milwaukee	0	------	0	68	13	21	0	2	0	35	127
Racine	0	------	0	7	0	5	0	0	0	8	13
Superior	0	------	0	0	0	3	0	0	0	0	6
Minnesota:											
Duluth	0	------	0	1	1	2	0	0	0	22	25
Minneapolis	1	7	0	2	1	17	0	0	0	33	110
St. Paul	0	------	0	0	2	8	0	0	0	24	74

[1] Figures for Barre and Tampa estimated; reports not received.

City reports for week ended March 8, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	0	------
Davenport	0	------	------	1	------	3	0	------	0	0	------
Des Moines	0	------	------	0	------	6	0	------	0	2	44
Sioux City	0	------	------	0	------	0	0	------	0	0	------
Waterloo	0	------	------	18	------	3	0	------	0	3	------
Missouri:											
Kansas City	0	------	1	2	9	5	0	6	0	24	92
St. Joseph	0	------	0	2	3	0	0	0	0	1	32
St. Louis	1	------	0	68	5	55	0	4	0	21	182
North Dakota:											
Fargo	0	------	------	1	------	1	0	------	0	16	------
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	1	------	------	0	------	0	0	------	0	3	8
South Dakota:											
Aberdeen	0	------	------	1	------	1	0	------	------	3	------
Nebraska:											
Lincoln	0	------	------	0	------	7	0	------	0	0	------
Omaha	0	------	0	2	1	1	0	3	0	1	62
Kansas:											
Lawrence	0	------	------	33	------	1	0	------	0	4	6
Topeka	0	------	0	59	3	2	0	0	0	17	6
Wichita	0	2	0	5	5	1	0	0	1	22	31
Delaware:											
Wilmington	1	------	0	218	4	0	0	2	0	3	34
Maryland:											
Baltimore	1	14	3	40	35	23	0	12	0	49	290
Cumberland	0	------	0	0	1	0	0	0	0	0	15
Frederick	0	------	0	0	0	0	0	0	0	0	8
Dist. of Col.:											
Washington	0	46	6	89	25	26	0	8	1	6	198
Virginia:											
Lynchburg	0	------	0	2	0	0	0	1	0	0	6
Norfolk	0	130	0	29	2	3	0	2	1	5	37
Richmond	0	------	2	24	8	1	0	1	0	0	65
Roanoke	1	------	0	122	2	0	0	0	0	5	15
West Virginia:											
Charleston	0	------	0	44	11	1	0	0	0	0	50
Wheeling	0	------	0	3	4	0	0	1	0	6	20
North Carolina:											
Gastonia	0	------	------	6	------	0	0	------	0	1	------
Raleigh	0	------	0	134	2	0	0	1	0	10	6
Wilmington	0	------	0	3	2	0	0	0	0	3	12
Winston-Salem	0	2	0	4	1	2	0	0	0	16	12
South Carolina:											
Charleston	0	44	1	10	1	2	0	0	9	1	22
Florence	0	6	0	11	3	0	0	1	0	2	12
Georgia:											
Atlanta	0	5	0	42	5	2	0	5	0	2	93
Brunswick	0	------	0	0	0	0	0	0	0	0	2
Savannah	0	32	4	4	3	1	0	0	0	0	44
Florida:											
Miami	0	8	0	10	2	2	0	1	0	3	56
Tampa	------	------	------	------	------	------	------	------	------	------	------
Kentucky:											
Ashland	0	------	0	0	1	0	0	0	0	0	7
Covington	0	1	0	18	0	1	0	0	0	1	9
Lexington	0	------	0	3	4	1	0	2	0	1	19
Louisville	0	2	1	173	9	69	0	6	0	10	81
Tennessee:											
Knoxville	0	------	0	28	3	8	0	3	0	4	36
Memphis	0	12	2	87	3	5	0	3	0	18	82
Nashville	0	------	0	19	5	10	0	0	0	8	62
Alabama:											
Birmingham	0	18	0	21	8	4	0	3	3	5	93
Mobile	1	12	0	6	3	0	0	0	0	0	------
Montgomery	2	26	------	0	------	1	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	4	------	0	0	------	0	0	------
Little Rock	0	------	2	3	3	1	0	0	0	0	25
Louisiana:											
Lake Charles	0	------	0	1	0	0	0	0	0	0	5
New Orleans	0	5	4	7	7	2	0	8	0	1	147
Shreveport	0	------	0	0	2	2	0	2	0	1	32

City reports for week ended March 8, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	18	0	1	2	3	4	2	0	2	46
Tulsa	0	------	0	1	5	1	0	1	0	6	29
Texas:											
Dallas	4	1	1	5	5	14	0	1	0	1	61
Fort Worth	0	------	2	156	3	0	0	1	0	8	45
Galveston	0	------	0	0	1	2	0	0	0	0	14
Houston	0	1	0	1	8	2	0	4	1	0	92
San Antonio	0	6	5	0	3	1	0	13	0	5	68
Montana:											
Billings	0	------	0	1	1	0	0	0	0	0	5
Great Falls	0	------	0	0	2	10	0	0	0	0	12
Helena	0	------	0	0	0	0	0	0	0	2	4
Missoula	0	------	0	0	1	2	0	0	0	0	4
Idaho:											
Boise	0	------	0	1	1	1	0	0	0	0	6
Colorado:											
Colorado Springs	1	------	1	1	0	5	0	------	0	0	10
Denver	5	19	1	85	1	7	0	1	0	29	78
Pueblo	0	------	0	1	1	5	0	0	0	2	8
New Mexico:											
Albuquerque	0	------	0	6	0	0	0	0	0	0	1
Utah:											
Salt Lake City	0	------	------	1	------	0	0	------	1	9	29
Washington:											
Seattle	0	------	2	3	3	4	0	6	0	4	89
Spokane	0	1	1	7	2	2	0	1	0	1	30
Tacoma	0	------	0	0	4	0	0	2	0	4	28
Oregon:											
Portland	1	4	0	24	1	2	0	1	0	0	71
Salem	0	------	------	3	------	0	0	------	0	0	------
California:											
Los Angeles	1	36	3	32	2	30	0	18	1	34	379
Sacramento	0	3	0	2	1	3	0	0	0	4	28
San Francisco	1	98	0	6	6	7	0	13	0	46	184

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Rhode Island:			
Providence	0	1	0
New York:			
New York	1	0	0
Pennsylvania:			
Scranton	1	1	0
Ohio:			
Cincinnati	1	0	0
Cleveland	1	0	0
Indiana:			
Indianapolis	0	1	0
Michigan:			
Detroit	1	0	0
Minnesota:			
Minneapolis	1	0	0
Maryland:			
Baltimore	2	0	0
District of Columbia:			
Washington	1	1	0
West Virginia:			
Wheeling	0	1	0
South Carolina:			
Charleston	1	0	0
Florence	0	1	0
Florida:			
Miami	0	0	2
Alabama:			
Birmingham	1	1	0
Idaho:			
Boise	1	0	0
California:			
Los Angeles	1	1	0

Encephalitis, epidemic or lethargic.—Cases: Springfield, Mass., 2; Buffalo, 1; New York, 1; Pittsburgh, 1; Columbus, 1; Topeka, 1. Deaths: New York, 4; Columbus, 1; Topeka, 1.

Pellagra.—Cases: Charleston, S. C., 2; Atlanta, 1; Savannah, 2; Sacramento, 1.

Rabies in man.—Deaths: Cincinnati, 1; Atlanta, 1.

Typhus fever.—Cases: New York, 1; Miami, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 15, 1941.—During the week ended February 15, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		3	3	6	9	2	2	5	4	34
Chickenpox		2		101	400	31	30	33	79	676
Diphtheria		14		11	5	2	2	2		36
Dysentery				2						2
Influenza		14			15	8			28	65
Lethargic encephalitis									1	1
Measles		226	135	241	1,090	147	381	828	800	3,348
Mumps				125	167	18	23	17	46	396
Pneumonia		20			19				8	47
Scarlet fever		44	3	119	174	9	3	10	13	375
Trachoma							1			1
Tuberculosis	1	8	15	79	52	2	14	1		172
Typhoid and paratyphoid fever				10	3					13
Whooping cough		1		158	167	37	19	9	12	403

CUBA

Habana—Communicable diseases—4 weeks ended March 8, 1941.—During the 4 weeks ended March 8, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	10	1	Scarlet fever	1	
Leprosy		2	Tuberculosis		2
Malaria	1		Typhoid fever	35	

DENMARK

Notifiable diseases—October–December 1940.—During the months of October, November, and December 1940, cases of certain notifiable diseases were reported in Denmark as follows:

Disease	October	November	December	Disease	October	November	December
Cerebrospinal meningitis	4	2	8	Measles	2,537	3,203	2,946
Chickenpox	812	1,391	1,257	Mumps	86	118	147
Diphtheria	69	54	52	Paratyphoid fever	3	1	3
Dysentery	60	20	27	Puerperal fever	20	18	12
Epidemic encephalitis	2	3		Scarlet fever	805	704	492
Erysipelas	298	276	250	Syphilis	55	44	39
Gastroenteritis, acute	2,190	2,312	1,925	Tetanus, neonatorum	8	4	
German measles	244	347	369	Typhoid fever	3		4
Gonorrhea	819	759	618	Undulant fever	56	49	36
Influenza	4,140	5,191	6,244	Weil's disease	2	6	3
Malaria			1	Whooping cough	2,361	2,590	2,300

YUGOSLAVIA

Notifiable diseases—4 weeks ended January 26, 1941.—During the 4 weeks ended January 26, 1941, certain notifiable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	4	2	Paratyphoid fever	9	
Cerebrospinal meningitis	212	48	Poliomyelitis	1	
Diphtheria and croup	357	42	Scarlet fever	199	4
Dysentery	33	6	Sepsis	8	3
Erysipelas	101	3	Tetanus	13	4
Favus	10		Typhoid fever	246	38
Lethargic encephalitis	2		Typhus fever	18	

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-December 1940	January 1941	February 1941—week ended—			
				1	8	15	22
ASIA							
Ceylon	C	1					
China[1]							
Dairen	C	2					
Foochow	C	625					
Hong Kong	C	867	5	1			
Macao	C	513					
Manchuria	C	31					
Shanghai	C	571					
Shantung Province	C	244					
India	C	[2] 43,094					
Bassein	C	164					
Bombay	C	13					
Calcutta	C	2,434	68				
Cawnpore	C	333					
Chittagong	C	4					
Karachi	C	65					
Madras	C	1					
Moulmein	C	16					
Porto Novo	C	1					
Rangoon	C	61					
Vizagapatam	C	21					
India (French)	C	34					
Indochina (French)	C	436					
Thailand	C	235					

[1] From the middle of June to the end of August 1940, 41,181 deaths from cholera were reported in China.
[2] January to August 10, 1940.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths]

Place		January-December 1940	January 1941	February 1941—week ended—			
				1	8	15	22
AFRICA							
Algeria	C	23					
Plague-infected rats		2					
Belgian Congo	C	26		1			
British East Africa:							
Kenya	C	9					
Uganda	C	277					
Egypt	C	[1] 409					
Madagascar	C	598	51		21	22	9
Morocco	C	1,099	146	64	88	45	32
Rhodesia, Northern	C	1					
Senegal:							
Dakar	D	[2] 1					
Thies	C	1					
Tivaouane	C	3					
Tunisia: Tunis	C	10	2				
Plague-infected rats		1					
Union of South Africa	C	[3] 37	8				
ASIA							
China: [4]							
Dutch East Indies;							
Java and Madura	C	378					
West Java	C	8					
India	C	[5] 14,438					
Bassein	C	18					
Cochin	C	1					
Plague-infected rats		5					
Rangoon	C	6		1			
Indochina (French)	C	5					
Thailand:							
Bangkok	C	3					
Plague-infected rats		2					
Bisnulok Province	C	3					
Chingmai	C	3					
Dhonpuri Province	C	1					
Jayanad Province	C	3					
Kamphaeng Bajr Province	C	29					
Kanchanapuri Province	C	12					
Koan Kaen Province	C	5					
Nagara Svarga Province	C	30					
Noangkhay Province	C	4					
Sukhodaya Province	C	22					
EUROPE							
Portugal: Azores Islands	C	3					
SOUTH AMERICA							
Argentina:							
Catamarca Province	C	10					
Cordoba Province	C	[6] 54	1				
Jujuy Province	C	9					
La Pampa Territory	C	1					
La Rioja Province	C	1					
Salta Province	C	8					
San Luis Province	C	2					
Santiago del Estero Province	C	85					
Tucuman Province	C	21					

[1] Includes 5 cases of pneumonic plague.
[2] Imported.
[3] Includes 6 cases of pneumonic plague.
[4] Information dated July 7 states that up to July 6, 17 cases of plague had been reported near Tungliao, Hsingan Province, China; and a report dated July 13 states that an outbreak of bubonic plague occurred along the Yunnan-Burma border in the districts of Loiwing, Chefang, Juili, and Muchieh. Information dated Aug. 17 states that 45 cases of plague with 36 deaths have occurred in Nungen District and a telegram dated Oct. 2 states that 15 cases of bubonic plague with 3 deaths occurred in Hsinking, Manchuria. During the week ended Nov. 16, 1940, an epidemic of bubonic plague was reported in Ningpo District, Chekiang Province, China.
[5] January to August 10, 1940.
[6] Includes 15 cases of pneumonic plague.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths]

Place		January-December 1940	January 1941	February 1941—week ended—			
				1	8	15	22
SOUTH AMERICA—continued							
Brazil:							
Alagoas State	C	9					
Pernambuco State	C	4					
Ecuador: El Oro Province	C	6					
Peru:							
Cajabamba Department	C	1					
Cajamarca Department	C	28					
Lambayeque Department	C	15					
Libertad Department	C	53					
Lima Department	C	57					
Piura Department	C	9					
Tumbes Department	C	[7] 21					
OCEANIA							
Hawaii Territory: Plague-infected rats		[8] 54	2		2	2	1
New Caledonia	C		7				

[7] Includes 3 suspected cases

[8] During the week ended Dec. 7, a positive mass inoculation of 12 rats and 1 mouse was also reported.

SMALLPOX

Place		January-December 1940	January 1941	February 1941—week ended 1	8	15	22
AFRICA							
Algeria	C	6	3		8	12	
Angola	C	271					
Belgian Congo	C	4,765					
British East Africa	C	59					
Dahomey	C	89	134		19	86	31
French Guinea	C	16	11				
Gibraltar	C	[1] 1					
Ivory Coast	C	132	8		6		1
Morocco	C	103					
Nigeria	C	2,319	74	9			
Niger Territory	C	664	9		5	6	32
Nyasaland	C	75					
Portuguese East Africa	C	1					
Rhodesia.							
Northern	C	6					
Southern	C	259	20				
Senegal	C	100	16		1	1	
Sierra Leone	C	10					
Sudan (Anglo-Egyptian)	C	535	1				
Sudan (French)	C	3				5	5
Union of South Africa	C	180					
ASIA							
Arabia	C	255					
China	C	958	18		14	5	1
Chosen	C	720					
Dutch East Indies—Sabang	C	4					
India	C	[2] 154,740					
India (French)	C	5					
India (Portuguese)	C	20					
Indochina (French)	C	1,571	42		38		75
Iran	C	177	4				
Iraq	C	935	149		65		
Japan	C	502	41			[3] 80	
Straits Settlements	C	1					
Sumatra	C	1					
Thailand	C	209	40	11	8		1
EUROPE							
France	C	[4] 4				1	
Great Britain	C	2					
Greece	C	23					
Portugal	C	504					
Spain	C	1,090	55	3			
Turkey	C	139					

[1] Imported.

[2] January to August 10, 1940

[3] For 3 weeks.

[4] For the month of June 1940.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths]

Place		January-December 1940	January 1941	February 1941—week ended—			
				1	8	15	22
NORTH AMERICA							
Canada	C	17		1			
Guatemala	C	35					
Mexico	C	55					
SOUTH AMERICA							
Bolivia	C	352					
Brazil	C	3					
Colombia	C	1,990	1	2			
Ecuador	C	1					
Peru	C	212					
Venezuela (alastrim)	C	224	21			6	

TYPHUS FEVER

Place		January-December 1940	January 1941	February 1941—week ended 1	8	15	22
AFRICA							
Algeria	C	2,146	224		154	198	
Belgian Congo	C	1,210					
British East Africa	C	2					
Egypt	C	3,636					
Eritrea	C	63					
Morocco	C	355	5	1		9	14
Rhodesia, Northern	C	7					
Tunisia	C	651	150		35	75	92
Union of South Africa	C	298					
ASIA							
China	C	2,191					
Chosen	C	359					
India	C	3					
Indochina (French)	C	2					
Iran	C	256	1				
Iraq	C	159	2		1		
Japan	C	2					
Palestine	C	203					
Straits Settlements	C	15	2				
Sumatra	C	[1] 196					
Trans-Jordan	C	15					
EUROPE							
Bulgaria	C	155	10	10		9	10
France	C	1					
Germany	C	230	71			25	
Greece	C	43	2	5			
Hungary	C	93	31			9	
Irish Free State	C	10	1				
Lithuania	C	115					
Rumania	C	1,403	112	56	60	69	40
Spain	C	14		3			
Turkey	C	533					
Yugoslavia	C	282	18	6			
NORTH AMERICA							
Guatemala	C	309	43				
Mexico	C	215					
Panama Canal Zone	C	3					
Salvador	C	1					
SOUTH AMERICA							
Bolivia	C	733					
Chile	C	427					
Ecuador	C	2	16				
Peru	C	988					
Venezuela	C	14	6			4	
OCEANIA							
Australia	C	12	3				
Hawaii Territory	C	28	2				

[1] For the period May to August 1940, inclusive.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-December 1940	January 1941	February 1941—week ended—			
				1	8	15	22
AFRICA							
Belgian Congo: Yatolet	C	1					
Cameroon: Nkongsamba	C	[1] 1					
French Equatorial Africa: Fort Archambault	C	[1] 1					
Gold Coast	C	1					
Ivory Coast	C	[2] 6	[1] 1				2
Nigeria:							
Ibadan	C	1					
Oshogbo	C	[1] 1					
Sudan (Anglo-Egyptian): Kordofan Province [3]	C	858					
Sudan (French): Segou	C	[1] 1					
Togo (French)	C	1					
SOUTH AMERICA							
Bolivia: Beni Department	C	1					
Brazil:							
Bahia State	D	1					
Espirito Santo State	D	140					
Minas Geraes State	D	2					
Para State	D	1					
Rio de Janeiro State	D	5					
Santa Catarina State	D	2					
Colombia:							
Antioquia Department—San Luis	D	2					
Boyaca Department	D		3				
Caldas Department—							
La Pradera	D	1					
Samana	D	1					
Victoria	D	1					
Cundinamarca Department	D	2					
Intendencias and Commissaries	C	5					
Meta Department	D	7	1				
Municipality of Jesus Maria	D	1					
Santander Department	D	3	2				
Tolima Department	D	12	1				

[1] Suspected.
[2] Includes 4 suspected cases.
[3] A report dated Nov. 13, 1940, also states that 8,000 cases of yellow fever with 800 deaths have been reported in Kordofan Province, Anglo-Egyptian Sudan.

X

Public Health Reports

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IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

CHARLES V. AKIN, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

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Public Health Reports

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PROGRESS REPORT OF PUBLIC HEALTH NURSING CURRICULUM COMMITTEE [1]

Need for study.—The need for a curriculum guide for public health nursing has long been manifest. Since 1910, when the first university public health nursing program of study was organized, 26 universities or colleges have established programs of study approved by the National Organization for Public Health Nursing. During that time the only guide to curriculum content has been the standards of the National Organization for Public Health Nursing which appear as "Minimum Requirements for Approved Post-Graduate Courses in Public Health Nursing." These standards have undergone no radical revision. However, it is recognized that during the same period of time profound changes have taken place in the factors that affect content and method, including the science of medicine and public health, psychology, social science, and public health and public health nursing administration. While it is true that these changes have been reflected somewhat in public health nursing curricula, it is open to question whether the changes have been sufficiently far-reaching in the preparation of the public health nurse to meet present-day needs and future opportunities.

In view of the foregoing, it was deemed wise by the education committee of the National Organization for Public Health Nursing and by the Collegiate Council on Public Health Nursing Education to reevaluate and to redefine the standards and objectives of public health nursing and of public health nursing education. In order to accomplish this task, the National Organization for Public Health Nursing requested the United States Public Health Service to participate in a joint undertaking. This request was granted and, in February 1940, Mary J. Dunn, Public Health Nursing Consultant, United States Public Health Service, was assigned to the study.

Appointment of committees.—A central committee and an advisory committee were then appointed by the National Organization for

[1] In response to many requests this report is submitted as a summary of the status of the work of the committee to date, briefly reviewing the beginning steps and indicating most recent developments. Prepared by Katharine Tucker, Chairman, and Professor of Nursing Education, University of Pennsylvania, Philadelphia; and Mary J. Dunn, Public Health Nursing Consultant, U. S. Public Health Service, and Secretary to Public Health Nursing Curriculum Committee.

Public Health Nursing and the United States Public Health Service, with Miss Katharine Tucker as chairman of both committees. The functions of these committees are as follows: The central committee to define the scope and objectives and to give general direction to the study; the advisory committee to advise the central committee and to interpret the objectives and progress of the study to interested individuals and groups. The membership of these committees will be found listed at the end of this report.

Objective of project.—The objective and scope of this joint project, as set forth by the central committee, have been stated as follows: To determine what the public health nurse practitioner needs to know and the best way of providing the knowledge, skills, and attitudes required for optimal public health nursing performance.

While it is recognized that the public health nursing program is part of a degree program, the committee is limiting its consideration to the professional content only, this professional content to be based on the assumption of adequate undergraduate preparation. (Curriculum guide for schools of nursing.)

As an outcome of this undertaking the committee hopes to realize a curriculum guide for public health nursing, one that will be flexible rather than "hard and fast," and that will meet the needs of the present and possibly of the next 4 to 5 years. Such a guide should indicate the knowledge, attitudes, skills, and understanding to be realized in order (1) to enable the public health nurse to carry out her functions, and (2) to develop an individual who is able to adjust to changing situations.

Steps in procedure.—The steps in procedure will be reviewed briefly.

1. In order to have some concrete starting point the first step was general agreement regarding the "functional areas" to be considered in the field of public health, with the result that the following tentative list of 16 areas was evolved:

Maternal health.
Infant health.
Preschool child health.
Health of school child.
Communicable disease control.
Tuberculosis control.
Control of venereal diseases.
Pneumonia, influenza, and the common cold.
Orthopedic and plastic conditions.
Cancer control.
Heart conditions.
Mental disorders and diseases.
Diabetes control.
Oral conditions.
Industrial hygiene.

The order of listing these areas has no special significance, and, as yet, no attempt has been made to consider these functional areas in the order of their importance.

It is recognized that additional areas, e. g., housing, geriatrics, etc., may need to receive particular consideration; likewise, certain desig-

nated areas may need to be considered in combination with other areas.

Furthermore, while it may appear that the functional areas selected are limited merely to age groups and to particular conditions or diseases; such aspects as the positive elements of health, the psychological and sociological aspects, will not be lost sight of, but should permeate each functional area.

It should be emphasized that this device was used for practical purposes, and when the material is reassembled and organized for publication it will undoubtedly appear in an entirely different form. For example, in the final revision the titles of the 16 tentatively selected areas may not all appear as separate categories, and such titles as community relations, principles of teaching, and principles of public health nursing may be added.

2. The second step was the formulation of public health objectives pertaining to the foregoing 16 functional areas. Since it was proposed by the Public Health Service that this project be considered as a pivotal study for all public health personnel, as well as for public health nurses, and in order to view public health nursing as an integral part of the whole field of public health, objectives were formulated sufficiently broad to embrace the entire public health program within the designated functional areas. Invaluable assistance was given by many public health administrators in the drafting of these public health objectives, prior to their endorsement by the Central Curriculum Committee.

3. The third step was the redefining of our public health nursing functions, based on the previously formulated public health objectives. The procedure followed in this revision was comparable to that mentioned with regard to the public health objectives, namely, consultation with many public health and public health nursing leaders, followed by endorsement of the Central Curriculum Committee.

4. The fourth step was the appointment of 15 production committees, whose responsibility is the production or preparation of a "course of instruction" in a designated functional area, e. g., industrial hygiene, cancer control. It was proposed by the Central Curriculum Committee that the material prepared by the production committees include: (1) The knowledge and skills essential to public health nursing performance in a given situation; and (2) the suggestive activities that might aid in the acquisition of the essential skills indicated.

It is recalled that while 16 functional areas were listed tentatively, only 15 production committees were appointed. This is due to the fact that material on the control of venereal diseases was prepared as a pattern or guide by Miss Dunn, who used various advisers in the place of a separate production committee for this particular area.

Membership of production committees.—The production committees are composed of public health nurses, centering geographically about the 26 universities or colleges offering approved public health nursing programs of study. Representation on these committees includes the respective public health nursing programs of study, and also members of urban, rural, official, and nonofficial public health agencies located within a reasonable radius of the university or college so as to facilitate working arrangements and travel.

Thus it is obvious that the public health nursing membership of these committees consists (1) of those who are primarily engaged in the preparation of public health nurses, and (2) of those who are utilizing the products of our public health nursing programs of study.

Although actual membership of these committees is limited to public health nurses, the committees are urged to consult with advisers in allied or special fields.

The production committee chairmen are as follows:

Production committee:	*Chairman*
Maternal Health	Hattie Hemschemeyer, Maternity Center Association, New York, N. Y.
Infant Health	Marcella Fay, Instructive Visiting Nurse Society, Washington, D. C.
Preschool Child Health	Eula Butzerin, Division of Biological Sciences, Nursing Education, University of Chicago, Chicago, Ill.
Health of the School Child	Ella McNeil, Division of Hygiene and Public Health, University of Michigan, Ann Arbor, Mich.
Communicable Disease Control.	Rena Haig, California State Health Department, San Francisco, Calif.
Tuberculosis Control	Mellie Palmer, Department of Preventive Medicine and Public Health, University of Minnesota, Minneapolis, Minn.
Pneumonia, Influenza, and the Common Cold.	Ellen Buell, Department Public Health Nursing, University of Syracuse, Syracuse, N. Y.
Orthopedic and Plastic Conditions.	Helen Lehman, School of Nursing, Western Reserve University, Cleveland, Ohio.
Cancer Control	Kathleen Leahy, School of Nursing Education, University of Washington, Seattle, Wash.
Heart Conditions	A. Louise Kinney, Division of Public Health Nursing, St. Louis University, St. Louis, Mo.
Mental Disorders and Diseases.	Ruth Gilbert, Psychiatric Social Service, New Haven Dispensary, New Haven, Conn.
Diabetes Control	Dorothy Carter, Boston Community Health Association, Boston, Mass.
Oral Conditions	Lucille Perozzi, Oregon State Health Department, Portland, Oreg.
Nutritional Conditions	Thelma Anderson, Tennessee State Health Department, Nashville, Tenn.
Industrial Health	Caroline di Donato, College of Nursing, Marquette University, Milwaukee, Wis.

Since the production committees are scattered throughout the country, it appeared essential to plan for a conference of the committee chairmen in order to arrive at some common understanding of the purpose and scope of the project, the responsibility of each committee, and the procedure to be followed in order to realize a reasonable de ree of similarity in the results. Consequently, a 2-day conference was held in Philadelphia, January 24–25, 1941, with Dr. Arthur Jones as curriculum construction consultant.

Dr. Jones presented certain philosophic principles basic to general education, and then applied them to the special needs of the public health nurse. He emphasized particularly the importance of the learning process and the role of the teacher in helping others to learn. His very practical suggestions regarding unit construction, together with the sample unit on venereal diseases, were accepted by the group as a guide or pattern to follow in the development of the assigned courses of instruction.

It was agreed by the various production committee chairmen that the assignment be completed and submitted to Miss Dunn by April 1.

The interest manifested by the conference members, the free and stimulating discussion, and the willingness of all to assume the important responsibility placed upon them should result in a public health nursing curriculum guide which will give a new, vital, and dynamic approach to learning, one that will not be stereotyped but will be capable of adaptation and of indicating direction.

PUBLIC HEALTH NURSING CURRICULUM COMMITTEE

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Marion Howell, Dean, Nursing School, Western Reserve University, Cleveland, Ohio.

[1] Central committee.

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Mrs. Abbie R. Weaver, Director, Division of Public Health Nursing, State Department of Health, Atlanta, Ga.
Ex officio members: Dr. Thomas Parran,[1] Pearl McIver,[1] Grace Ross,[1] Dorothy Deming,[1] Mary Connor.[1]

HYDROGEN SULFIDE: ITS TOXICITY AND POTENTIAL DANGERS

Prepared by the Division of Industrial Hygiene, *National Institute of Health, United States Public Health Service*

Hydrogen sulfide is an irritant and toxic gas. It causes irritation of the entire respiratory system and of the conjunctiva of the eye, and in high concentrations it may produce respiratory paralysis and neurological changes.

Physico-Chemical Properties of Hydrogen Sulfide.

Hydrogen sulfide, H_2S, is a colorless gas having an offensive odor, as of rotten eggs, at low concentrations and a sweetish odor at high concentrations. Even high concentrations may not be detected by the odor on account of their rapidly paralyzant effect on the olfactory nerve. It is combustible in concentrations of between 4.4 and 44.5 percent in air, has a molecular weight of 34.08, a specific gravity of 1.192 (air=1), a boiling point of −59.6° C. and a melting point of −82.9° C. It is soluble in 100 parts of water to the extent of 437 cc. at 0° C. and 186 cc. at 40° C.; in 100 parts of alcohol, 9.54 cc. are dissolved at 15° C.; and it is soluble in hydrocarbons such as gasoline, kerosene, and crude oil.

Maximal Permissible Concentration of Hydrogen Sulfide.

The maximal permissible concentration of hydrogen sulfide in air is accepted at present as 20 parts per million by volume, corresponding to 0.028 milligrams per liter of air at 25° C. and 760 mm. Hg for exposures not exceeding a total of 8 hours daily.[2]

[1] Central Committee
[2] This figure for the maximal permissible concentration of hydrogen sulfide has been accepted and published by the American Standards Association in its Standard on Allowable Concentrations of Toxic Dusts and Gases—Z37 2-1941 This standard may be purchased from the American Standards Association, 29 West Thirty-ninth Street, New York, N. Y.

Sources of Exposure to Hydrogen Sulfide.

Hydrogen sulfide occurs naturally in the gases of volcanos and in the waters of certain spas, in mines, as for instance from the decomposition of pyrites, and in certain sulfur-carrying brands of coal oil. In the latter, hazards from hydrogen sulfide appear to exist mainly in "lime wells", whereas "granite-wash wells" contain only concentrations of up to 0.01 percent hydrogen sulfide (*1, 2*). It should be pointed out that both water and petroleum products can carry dangerous concentrations of hydrogen sulfide in solution, which may be given off later.

It occurs wherever *protein-containing materials* are putrefying, as for instance in tanneries (*3, 4*); in the manufacture of glue; in washings from sugar beets; and in sewer gases.

In the *chemical industry* hydrogen sulfide may be formed in a variety of processes, as for instance in the manufacture of carbon disulfide, of sulfur dyes, and of soda according to the LeBlanc process.

Exposure to hydrogen sulfide may also exist in the *rubber industry* and in the *rayon industry* where the viscose process is used.

Determination of Hydrogen Sulfide in Air.

For the determination of hydrogen sulfide in air, samples should be taken wherever there is a known or suspected source of hydrogen sulfide. Such samples should be taken at the breathing zones of the workers exposed, special emphasis being given to the locations nearest the source and those in the path of air currents carrying the gas. They should be taken at sufficient intervals of time so that any variations in concentrations will become evident and in sufficient number to avoid any reasonable doubt of the results found.

To rely on the detection of hydrogen sulfide by its odor is extremely treacherous because the olfactory nerve endings are readily paralyzed by the gas.

It can be qualitatively detected by the darkening of moist lead acetate paper in an atmosphere containing hydrogen sulfide (*5, 6*) and the following tabulation may give an indication of the relation between this reaction and the odor of such mixtures (*6*).

Concentration		Odor	Reaction with lead acetate paper
Parts per million	Mg. per liter		
340	0.47	Marked	Immediately.
34	.047	do	Do.
3.4	.005	Distinct	After 2 seconds.
0.34	.0005	Noticeable	After 30 seconds.

Hydrogen sulfide may be determined quantitatively by passing the contaminated air through a titrated iodine solution which, however,

gives reliable results only in the absence of light. The reaction takes place according to the equation $H_2S+I_2=2HI+S$.

Hydrogen sulfide may also be determined (*7*) by passing the contaminated air through bromine water and subsequent gravimetric determination of the sulfate formed as barium sulfate.

Concentrations of Hydrogen Sulfide in Air.

Concentrations encountered in different industries may show considerable variation (*8*).

Absorption and Elimination of Hydrogen Sulfide.

Hydrogen sulfide is mainly absorbed through the lungs; the absorption from the gastro-intestinal tract is of no importance in regard to its hazards in industry.

The possibility of its absorption through the skin has aroused much controversy since cases of hydrogen sulfide poisoning from the use of sulfur ointments have been reported repeatedly. From animal experiments (*9*) it appears not certain that this is the case, but even if it takes place (*10*) the absorption is too slow to cause systemic effects.

Hydrogen sulfide is eliminated mainly through the lungs. A small fraction is excreted with the urine, as sulfide.

Determination of Hydrogen Sulfide in Urine.

Since hydrogen sulfide may be formed by putrefaction in urine, only freshly voided samples can be expected to give results of significance for exposure to hydrogen sulfide. A current of air is first passed through a solution of potassium hydroxide and then through the urine and hence into a narrow glass tube containing a strip of moistened lead acetate paper. The hydrogen sulfide may also be determined colorimetrically by the Caro-Fischer method (*11*).

Relation Between Concentrations of Hydrogen Sulfide in Air and Toxic Symptoms.

Table 1 illustrates the physiological effects of hydrogen sulfide in man with certain concentrations determined by the iodine method (*12, 13*).

In viscose plants it was found that 16 parts per million cause no irritation, whereas, with concentrations varying from 18 to 28 parts per million, 25 out of 78 persons complained of irritation of the eyes (*14*). It has been stated that exposure to 5,000 parts per million may be immediately fatal; with exposure for one-half to 1 hour to 500 to 700 parts per million life may be endangered; and no systemic effects should be expected even with continued exposure to such low concentrations as 30 to 50 parts per million. On the other hand, it appears that the local effects, especially irritation of the eyes, may occur occasionally even with concentrations as low as 15 parts per million (*14*).

TABLE 1.—*Relation between toxic action of hydrogen sulfide and its concentration in air*

[K. B. Lehmann (*12*)]

Concentration		Duration of exposure	Symptoms	Aftereffects
Parts per million	Mg. per liter			
20- 40	0 027-0.054	....	No irritation.	
70- 90	0 097-0 125	....	Slight irritation.	
100-140	0 139 0.194	3 hrs..........	Irritation, salivation, nasal secretion after 1 hr. 20 min., cough after 1 hr. 51 min., after 1 hr. 55 min. irritation less, after 3 hrs. all complaints disappear.	Irritation, conjunctivitis, fever, bronchitis, and diarrhea.
246-410	0 342-0.570	1 hr. 45 min....	Irritation, later impaired respiration, later decreased irritation, conjunctivitis	Marked irritation, fatigue, bronchial catarrh.
373-493	0.518-0.865	1 hr 32 min ...	Irritation and nasal secretions.	Later marked pain in eyes, cough, fatigue, loss of appetite, bladder spasms, diarrhea.
532	0.740	30 min........	Marked irritation, nasal catarrh, impaired respiration, tachycardia, palpitation, cough, unsteady gait, tremors, fatigue, and headache.	Marked irritation, fatigue, and bronchial catarrh.

The Clinical Picture of Hydrogen Sulfide Poisoning.

The toxic effects produced by hydrogen sulfide vary considerably with the concentration to which a person may be exposed.

With high concentrations, the victim may suddenly collapse and die from respiratory paralysis. In case the exposure is not quite so severe, there may be a progressive depression of the respiration and death may result from paralysis of the respiratory center. With less serious exposure the irritant action of hydrogen sulfide may be predominant, resulting in irritation of the mucous membranes of the eye and of the respiratory tract, causing, possibly, pulmonary edema or bronchial pneumonia.

Whereas with massive exposure the depressant effect on the central nervous system predominates, continued exposure to lower concentrations may cause fatigue, headache, especially in the temples, and such nervous conditions as irritability and sleeplessness.

The irritant action of hydrogen sulfide on the mucous membranes of the respiratory tract may lead to rhinitis, bronchitis, and pneumonia (*15*).

This irritant effect is, however, most conspicuous on the membranes of the eye and it may result in very painful conjunctivitis with marked injection, lacrimation, photophobia, and occasionally in defects of the cornea. It appears that under certain conditions such defects may be the first and main symptom, leading to foggy vision and other disturbances such as colored rings around the lights, which may be due to interference phenomena. The defects represent punctated erosions of the cornea (*16*) which in severe cases may flow together

and in which the epithelial layers are loosened; this condition may be preceded by a period of scaling (*17*).

Regarding the effects of hydrogen sulfide on the *gastro-intestinal tract*, loss of appetite, loss of weight, nausea and vomiting (*18*) have been associated with exposure to hydrogen sulfide; animal experiments (*19*), however, appear to indicate that there is no direct toxic effect of hydrogen sulfide on the digestive organs.

Direct contact with hydrogen sulfide may cause hyperemia and erythema of the skin (*10*). The statements that even low concentrations interfere with the healing of small wounds (*20*) and that the continued exposure to aqueous solutions, as for instance in certain mines and spas, may lead to the formation of blisters and ulcers appear to need further study.

Late effects of hydrogen sulfide poisoning may result in inflammatory processes of the respiratory tract (*15*) or in circulatory disturbances characterized by bradycardia and temporary weakening of the cardiac muscle (*21*); peripheral neuritis, lymphocytosis, and gastro-intestinal disturbances have also been reported as sequelae of hydrogen sulfide exposure (*22*, *23*).

Regarding the possibility of habituation to exposure to hydrogen sulfide, it appears that this does not exist; on the contrary, animal experiments (*13*) and experience in humans indicate that hypersusceptibility may result from the toxic effects of hydrogen sulfide.

The question has been raised repeatedly as to whether or not hydrogen sulfide and carbon disulfide have a synergistic action, but experiments (*24*) appear to indicate that the two compounds have only an additive effect.

The Pathological Changes in Hydrogen Sulfide Poisoning.

Regarding pathological changes resulting from exposure to hydrogen sulfide, information is very limited. In animal experiments the picture varies considerably with the intensity of the exposure (*25*). Whereas in acute poisoning the organs, especially the lungs, are practically of normal appearance or are collapsed, of pink to white color and of leatherlike consistency (*26*), in subacute poisoning there is always a more or less marked hyperemia and congestion. The blood vessels of the lungs are engorged, the alveoli sometimes destroyed or filled with transudate and blood, and with repeated exposure the former may also contain leucocytes. This transudation may result in pulmonary edema and, in addition, liver, kidneys, and spleen may contain considerable pigment deposits (hemosiderin) which in the case of the liver are mainly located in the Kupffer's cells (*9*) which may also show signs of degeneration and necrosis.

Mechanism of the Action of Hydrogen Sulfide.

The mechanism of the toxic action of hydrogen sulfide is in part still controversial. Early investigators assumed that it affected the hemoglobin by the formation of sulfhemoglobin, but, although this reaction may take place *in vitro*, it has not been observed *in vivo* (*27*) or has been seen only experimentally with extremely high concentrations. Hydrogen sulfide reacts readily, however, with methemoglobin, forming sulfhemoglobin, and this may explain its presence in the blood of cadavers.

Others have assumed that hydrogen sulfide is, primarily, a nerve poison.

More recently it has been claimed that hydrogen sulfide interferes mainly with the oxygen metabolism of the cell by affecting the iron-containing ferment and that the primary stimulation of the respiration is not due to irritation but is a sign of beginning anoxia. This assumption was partly based on the observation that in animal experiments exposure to hydrogen sulfide increased the oxygen capacity of the venous blood considerably, which was interpreted as a result of an inability of the tissue to assimilate the oxygen of the arterial blood to the same extent as normally (*28*), and that the administration of iron may alleviate this effect (*29, 30*). Other investigators (*31*) confirmed this phenomenon but found that this change later on moves in the opposite direction, which could not be explained on the basis of respiratory paralysis, and that it appears more likely that such changes of the composition of the blood gases are due to changes of the respiratory type, that is, primary hyper- and subsequent hypo-ventilation corresponding to the irritant effect on the mucous membranes and the depression of the central nervous system.

Regarding the fate of hydrogen sulfide in the organism, some investigators assume that it combines with the alkali of the blood and circulates as sodium sulfide, and it has been suggested (*32*) that this reduction of the alkali reserve may play a part in acute hydrogen sulfide poisoning. According to others (*33*) hydrogen sulfide is detoxified in the blood by oxidation and for this reason administration of oxygen, if necessary combined with artificial respiration, may prove beneficial.

Prophylactic Measures.

In order to prevent hydrogen sulfide poisoning, it is of great importance that all those handling this material or who may be exposed to it be informed regarding its toxicity and potential dangers, and also of the fact that in its detection one cannot rely upon the characteristic odor because, as pointed out above, the olfactory nerve is paralyzed very readily by hydrogen sulfide.

In evaluating the potential dangers of hydrogen sulfide, it appears important to realize that the toxicity may increase with the humidity

of the air because the moisture in the air may become saturated with hydrogen sulfide and this acid mist may be a contributing factor (*34*). In addition, other factors which tend to increase the respiration, such as an increase in the carbon dioxide and a decrease in the oxygen content of the air, and physical exercise, may be aggravating factors in the onset of hydrogen sulfide poisoning.

It is, therefore, essential that, in all operations where hydrogen sulfide may contaminate the air, the concentration of 20 parts per million be maintained by proper exhaust ventilation, preferably at the site of the formation of the gas. In order to destroy hydrogen sulfide in waste water, as for instance in the washing of beets, chlorination of such waste water with sodium hypochlorite (*35*) may prove helpful.

Whenever rooms or enclosures (sewers, beet bins, etc.) have to be entered which may contain hydrogen sulfide, this should be done only with open-air masks, safety belts, and under the supervision of a crew familiar with the potential dangers of such exposure and with the proper first-aid measures.

Treatment of Hydrogen Sulfide Poisoning.

In poisoning from hydrogen sulfide, the patient should be transferred to fresh air as quickly as possible. He should be kept at rest, and should be placed under the care of a physician. Any chilling should be prevented. If the respiration is slow, labored, or impaired, artificial respiration may become necessary. This should, however, be performed with great caution on account of the possible hyperemia and congestion of the lungs. If necessary, artificial respiration may be combined with the inhalation of oxygen.

Conjunctivitis resulting from exposure to hydrogen sulfide may be treated by instillation of 1 drop of olive oil which is said to alleviate the pain. In severe cases, administration of 3 to 4 drops of 1 :1,000 solution of epinephrine every 5 minutes may prove helpful. If the pain becomes very severe, local anesthetics and hot or cold compresses may be of benefit.

The irritation of the respiratory tract should be treated symptomatically and expectoration of mucus should be facilitated by the administration of expectorants.

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TISSUE FACTORS IN ANTIRABIES IMMUNITY OF EXPERIMENTAL ANIMALS [1]

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The mechanism of immunity developing after antirabies vaccination, the site of that immunity, and the role of the circulating blood serum antibodies in protecting the immunized animal from rabies infection have not been determined definitely. Indeed, there is no incontrovertible evidence in the literature to show the exact pathway traveled by rabies virus, introduced peripherally, to its ultimate arrival in the central nervous system.

Goodpasture (*1*) showed in rabbits that the early appearance of localized paralysis and histological cellular changes were suggestive of spread centrally along the peripheral nerve when virus was injected into the masseter muscle, and Schaffer (*2*) reported similar findings when virus was given into the leg muscles. That virus injected into the gastrocnemius muscle of mice appears in the lumbar cord in 3 to 5 days, then passes rapidly to the brain where it multiplies quickly to give symptoms from the ninth to the fourteenth day, has been demonstrated by Webster (*3*, *4*), who also states that when subcutaneously introduced the virus appears in the area of the central nervous system supplying that particular skin region, although the virus cannot be demonstrated in the peripheral nerve until it is also present centrally. That the virus can spread centrally when introduced into a peripheral nerve and peripherally when injected intracerebrally has been demonstrated by Nicolau and his coworkers (*5*, *6*, *7*), who also proved the necessity of uninterrupted continuity of the peripheral nerve for accomplishing this spread.

Gantt and Ponomarew (*8*) succeeded in infecting dogs with fixed virus given intramuscularly only when a spinal tap was performed simultaneously. Intraneural injection produced infection only if the site of inoculation was incised. On the basis of these findings, the authors conclude that the central spread of rabies virus is along axis cylinders, with the normal flow of lymph in the nerves as a factor.

[1] From the Division of Biologics Control, National Institute of Health.

Manouelian (*9*) has found the sympathetic neurones to be quite susceptible to rabies virus and suggests that "endoneurocytes," which are neurones supplying sensory nerves, may carry the virus. Pigalev (*10*) suggests that peripheral nervous stimulation is a factor in determining the site of localization of virus in the central nervous system. Sabin, Casals-Ariet, and Webster (*11*) have traced the spread of virus, by histological and animal inoculation techniques, through the central nervous system after intranasal instillation. Virus was first demonstrated in the brain on the third to fourth day and then quickly spread through the central nervous system. It was occasionally demonstrated in the rhinencephalon before being present in the rest of the brain.

Levaditi and Schoen (*12*), in attempting to demonstrate local multiplication of virus, found that Negri bodies could not be demonstrated in the inoculated cornea of rabbits until they were also in the uninoculated eye and the animal showed symptoms.

Remlinger and Bailly (*13*) demonstrated virus at the site of intracerebral inoculation and in nuclei of the facial nerve on the ninth day, although the controls did not develop symptoms until the sixteenth day and the concentration of virus was greatest in the facial nuclei. Because of the early invasion of the nervous system these writers feel that the vaccine treatment must neutralize the virus after it has reached the nervous tissue.

Leach and Johnson (*14*) examined tissues from three human cases of rabies for the presence of virus. They were unable to demonstrate it in the spinal fluid, blood, kidney, liver, pancreas, spleen, or adrenal. Virus was present in the lacrimal and salivary glands. Investigation of the distribution of virus in the brain showed the highest titer to be in the anterior central gyrus, thalamus, pons, medulla, cervical thoracic and lumbar cords.

Of several attempts to infect animals by administering the virus intravenously some have been successful (*15, 16, 17*), others unsuccessful (*18*), but this does not appear to be a factor in the pathogenesis of the naturally occurring disease. Likewise, the isolation of virus from the blood of an infected animal at any time during the disease has been rather rare. Marie and Urbain (*19*) report several successful attempts. Schweinburg and Windholz (*20*) used parabiotic rats to disprove the presence of virus in the blood as a factor in the development of rabies.

Hurst (*21*), in summarizing the subject, states that most of the evidence points to a neural pathway of virus spread but that this is difficult to explain in view of the physical constitution of the nerve fibers and that the perineural lymphatics and the cerebrospinal fluid may play a secondary role.

As to which cell type produces antibodies and which tissues are responsible for destruction of virus introduced into an immunized animal, Tzeknovitzer and Goldenberg (*22*) found by immunizing rabbits subcutaneously, intramuscularly, subdurally, meningeally, and intracerebrally that it is possible for meningeal, ependymal and neuroglial cells to produce antibodies, but concluded that the most important factor in immunity is the ability of antibodies produced elsewhere to penetrate the blood-brain barrier.

Biglieri and Villegas (*23*) found that direct vaccination of nervous tissue gave but a slight prolongation of the incubation period on subsequent infection but that neutralization tests with tissues of an immunized animal showed the nervous tissue equal in virus neutralizing properties to liver and spleen but less than the adrenals. On the other hand, Pereira da Silva (*24*) could not demonstrate the virus neutralizing property of brain tissue of an immunized animal nor could Jonesco (*25*) of a naturally immune dog. The spleen has no important role in antirabies immunity as shown by Plantureaux (*26*), whose dogs, splenectomized before and after immunization, were still immune. In the experiments of Marie (*27*), fixed virus intraperitoneally did not produce rabies unless the reticulo-endothelial system was first blocked by India ink. Nicolau and his coworkers (*28*) discovered that there were definite histological changes in the central nervous system following rabies immunization of rabbits, most marked in the lumbar cord posterior ganglia and posterior horn cells with milder cellular reactions higher up in the cord and brain.

In studying the mechanism of the immunity produced by the Pasteur method, Cruveilhier, Nicolau, and Kopciowska (*29*) found no live virus in the nervous system of vaccinated animals although there were definite histological changes. Street virus injected into the sciatic nerve at the start of immunization caused rabies, but partial immunity was demonstrated when the inoculation was made on the fifth day of immunization.

That virus-neutralizing immune bodies appear in the blood serum of animals and humans following rabies vaccine has been demonstrated by many workers, but there does not appear to be any definite relationship between the titer of these neutralizing bodies and the degree of actual immunity to virus introduced through natural channels (*30*).

An attempt was made in the series of experiments here reported to determine the tissue site of antirabies immunity by observing any difference in the progression of peripherally introduced virus in normal and in immunized mice and guinea pigs, as well as by the titration of the virus-neutralizing properties of tissues of immunized rabbits. The experiments with mice have been carried out on two groups, one

immunized with a live virus vaccine and the other with phenolized virus vaccine.

PREPARATION OF VACCINES

Rabbit No. 1 received intracerebrally 0.2 cc. of a 1:10 emulsion supernatant of fixed rabies virus mouse passage brain and was completely paralyzed in 7 days. It was then killed with chloroform, the brain removed and divided longitudinally into two parts, each of which was weighed, then emulsified in a 20 percent emulsion after straining through gauze. To the 20 percent emulsion of half of the brain was added an equal amount of 2 percent phenol and the flask was placed in the incubator at 37° C. for 24 hours, after which both were diluted to a 5 percent emulsion.

IMMUNITY OF VACCINATED MICE TO FIXED RABIES VIRUS INTRACEREBRALLY

The degree of immunity to a post-vaccination test dose of fixed virus intracerebrally was tested for each of the vaccines. Twenty-five white mice weighing 20 to 25 gm. were given 0.25 cc. of a 1:20 dilution of each vaccine, intraperitoneally, every 2 days for 6 doses. Twenty-eight days from the beginning of the vaccination these mice were injected intracerebrally with serial dilutions of a heterologous strain of fixed virus in doses representing 1, 10, 25, 50, 100, and 200 M. L. D. The results as shown in table 1 indicate that the live fixed virus vaccine protected mice against 10 M. L. D. while the phenolized fixed virus vaccine protected against but 1 M. L. D.

TABLE 1.—*Immunity titer of 2 types of vaccine in mice*

Type of vaccine	Fixed virus dilution—test dose 0 03 cc. intracerebrally							Protected against
	1:50	1 100	1:200	1.400	1.1000	1.10,000	1.100,000	
Live fixed virus	[1] 14 14 [2] S	10 12 14 S	12 22 S S	4 13 18 S	21 S S S	S S S	-------	10 M.L.D.
Phenolized fixed virus	11 11 12	10 S S	12 14 S	13 14 S	13 14 S S	S S S	------	1 M.L.D.
Controls	---------	11 11 18	-----------	---------	13 14	15 19 21	14 S S	---------

[1] Day of death.
[2] Survived.

PROGRESSION AND *in vivo* NEUTRALIZATION OF RABIES STREET VIRUS IN THE TISSUES OF IMMUNIZED MICE

Twelve Swiss mice weighing 25 to 30 gm. were immunized with 0.25 cc. of a 1:10 dilution of each vaccine, intraperitoneally, every 2 days for 9 doses. Fifty days following the beginning of this immunization all mice in each group and an equal number of controls were given 0.02 cc. of a 1:5 dilution of first passage guinea pig street virus

brain into the gastrocnemius muscle of the right hind leg. Twenty-four hours after this intramuscular injection of street virus and again at 48 hours and at 10 days, mice from each group and from the controls were killed with chloroform and under aseptic conditions the gastrocnemius muscle of the right hind leg, the right sciatic nerve, the lumbar portion of the spinal cord, the brain, and the spleen were removed. Each tissue was finely divided, washed three times with sterile salt solution, then emulsified at approximately 1:5, centrifuged at 1,000 r. p. m. for 5 minutes, then 0.03 cc. of the supernatant was injected intracerebrally into 3 young Swiss mice weighing 10–15 gm. These mice were observed for 60 days and an attempt was made to check all deaths by examination of smears from Ammon's horns for Negri bodies. However, many of the mice died during the night and had been eaten by their cage mates before morning. In table 2 those mouse brains that were examined for Negri bodies are indicated as being either positive or negative. Taking 2 deaths after the tenth day out of the three mice injected with each tissue, whether examined for Negri bodies or not, or at least one death in which Negri bodies were found, as the criterion for the presence of virus, it was found that by 24 hours the street virus was not demonstrable in the muscle of the controls but was present in the sciatic nerve; after 48 hours the virus was still present in the sciatic nerve and had also reached the lumbar cord. Ten days following its introduction it was not recovered in any of the tissues examined.

TABLE 2.—*Presence of street virus in tissues of immunized mice 1, 2, and 10 days following peripheral injection of street virus*

Type of vaccine, mouse immunization	Time after street virus intramuscularly	Tissue emulsions injected intracerebrally in mice 0.03 cc. of 1.5 emulsion														
		Muscle			Sciatic nerve			Spinal cord			Brain			Spleen		
Live fixed virus vaccine	24 hours	[1] 16	[2] S	S	6	16	S	14	S	S	S	S	S	15	S	S
	48 hours	14	15	S	S	S	S	12	S	S	14	S	S	14	S	S
	10 days	S	S	S	7	7	7	7	S	S	6	6	[3] 0	4	12	S
Phenolized fixed virus vaccine	24 hours	26	S	S	S	S	S	S	S	S	15	S	0	13	58−	0
	48 hours	9−	9+	S	11	19	19	10	10	12	11+	12+	16	9	10	S
	10 days	6	S	S	7	20+	22+	4	6	16+	6	17+	S	S	S	S
Controls	24 hours	6	S	S	8	20+	0	0	S	S	0	S	S	0	S	S
	48 hours	13−	0	S	12+	15+	S	12+	S	S	S	S	S	S	S	S
	10 days	4	4	6	6	S	S	4	5	S	0	S	S	6	0	S

+ = Positive for Negri bodies.
− = Negative for Negri bodies.
[1] Number = Day of death.
[2] S = Survived.
[3] 0 = Traumatic death.

In the mice immunized with the phenolized virus vaccine the street virus was demonstrated only in the spleen at the end of 24 hours, in all the tissues except the spleen in 48 hours, and in the sciatic nerve,

spinal cord, and brain in 10 days. In the group immunized with live virus vaccine the street virus was present in none of the tissues after 24 hours, in 48 hours only in the muscle, and in 10 days in none.

As a secondary control several mice of each vaccinated group and of the controls were observed for a period of 60 days. None developed symptoms and all survived, including the control mice.

In vitro NEUTRALIZATION OF FIXED RABIES VIRUS BY TISSUES OF IMMUNIZED RABBITS

Rabbits weighing 1,500 to 2,000 gm. were immunized with a daily dose of 2 cc. of the undiluted vaccine, subcutaneously, in the abdomen for 15 doses. Fifty days later these rabbits and a control of equal weight were bled to death and under aseptic conditions a portion of the hamstring muscles, sciatic nerve, lumbar cord, and brain were removed and weighed, then divided into very small pieces and thoroughly washed with sterile salt solution three times. The washed tissue was then emulsified to make a 10 percent emulsion by weight except the sciatic nerve which was diluted to a 5 percent emulsion. Equal parts of these emulsions were mixed with 1:5, 1:50, and 1:500 dilutions of fixed virus, the titer of which was 10^{-4}, so that the resulting mixtures would contain 10, 100, and 1,000 M. L. D. of the test virus. The virus-tissue mixtures were incubated at 37° C. for 2 hours, then placed in the ice box overnight, and the following morning 0.03 cc. of each mixture was injected intracerebrally into 3 white mice (20 to 25 gm.). These mice were observed for 30 days; table 3 shows the time of deaths.

TABLE 3.—*In vitro neutralization of fixed virus by tissues of immunized rabbits*

Type of vaccine, rabbit immunization	Test dose, number M. L. D. of fixed virus	Tissue emulsion mixed with test dose 0.03 cc. intracerebrally in mice											
		Muscle			Sciatic nerve			Spinal cord			Brain		
Live fixed virus vaccine	10	[1] 12	[2] S	S	S	S	S	S	S	S	10	13	S
	100	S	S	S	9	10	11	9	9	11	9	11	12
	1,000	10	10	11	9	9	9	8	8	9	9	9	11
Phenolized fixed virus vaccine	10	S	S	S	S	S	[3] 0	8	10	S	S	S	S
	100	S	S	S	11	14	S	8	11	0	8	9	10
	1,000	9	9	10	8	8	9	9	10	11	7	8	10
Controls	10	S	S	S	9	12	S	10	10	S	9	10	15
	100	10	S	S	7	10	11	8	11	12	10	10	10
	1,000	7	8	11	8	9	12	8	8	10	10	10	12

[1] Number=Day of death.
[2] S=Survived.
[3] 0=Traumatic death.

The tissue of the control rabbit showed no neutralization of virus except with the muscle tissue which neutralized 10 and 100 M. L. D.

The rabbit immunized with phenolized fixed virus vaccine gave the same neutralization with the muscle as did the control but also had

protection against 10 M. L. D. in the brain and 20 M. L. D. in the sciatic nerve.

Live fixed virus vaccine gave virus neutralization of 10 M. L. D. in the spinal cord, 20 M. L. D. in the sciatic nerve, but none in the brain and the same as the control in the muscle.

VIRUS-NEUTRALIZING PROPERTIES OF SERA OF IMMUNIZED RABBITS

Blood removed at the time the immunized rabbits were killed on the fiftieth day after vaccination was used to determine the titer of virus neutralizing antibodies in the serum. Equal parts of serum and dilutions of the same fixed virus used as test dose throughout this study were mixed and incubated at 37° C. for 2 hours, then 0.03 cc. injected into 3 white mice (20 to 25 gm.). The virus-serum mixture for each serum represented 1, 10, 25, 50, and 100 M. L. D. of virus. Results tabulated in table 4 show that the phenolized virus vaccine serum neutralized but 50 M. L. D. of virus, whereas the live virus vaccine neutralized at least 100 M. L. D.

TABLE 4.—*Serum neutralization titer of immunized rabbits*

Type of vaccine, rabbit immunization	Fixed virus dilution mixed with serum 0.03 cc. intracerebrally in mice																		Serum protected against
	1:5			1:10			1:20			1 50			1:500			1:5000			
Live fixed virus vaccine	[1] S	S	S	S	S	S	S	S	S	S	S	S	S	S	S				100 M.L.D.
Phenolized fixed virus vaccine.	[2] 10	14	S	S	S	S	13	S	S	S	S	S	S	S	S	....			50 M.L.D.
Control	....			11	11	9	10	10	12	10	12	12	11	12	13	14	S	S	....

[1] S=Survived.
[2] Number=Day of death.

PROGRESSION AND *in vivo* NEUTRALIZATION OF STREET VIRUS IN GUINEA PIGS RECEIVING POST-INFECTION IMMUNIZATION

Ten guinea pigs weighing 250 to 300 gm. were given 0.25 cc. of a 1:10 emulsion supernatant of first guinea pig passage street virus brain into the left gastrocnemius muscle. Five of these guinea pigs were started on a daily dose of 2 cc. of a 15 percent phenolized rabies vaccine given subcutaneously into the abdomen. This vaccine had previously been shown to be highly immunizing by the mouse test.

One guinea pig from the vaccinated and one from the unvaccinated group were killed by exsanguination on the first, second, fourth, seventh, and fourteenth days following the intramuscular injection of street virus.

The muscle at the site of inoculation, sciatic nerve on the left, spinal cord, and brain were removed, washed with salt solution, and emulsified at 1:10 with alundum in 10 percent solution of horse serum in distilled water. These emulsions were centrifuged and 0.03 cc. of

the supernatant injected intracerebrally into three 1-month old Swiss mice. Three mice were also given, intracerebrally, 0.03 cc. of the blood serum taken at the time of killing the animal. The mice were observed for a period of 2 months and all deaths were checked for the presence of Negri bodies in smears made from Ammon's horn. As a further control, a group of three guinea pigs received the same dose of street virus in the gastrocnemius muscle and were observed for 2 months. Two of the three died and were Negri-positive. As a control on the immunizing power of the vaccine we have the results of another experiment in guinea pigs run at the same time as the experiment being reported here. Ten guinea pigs received the same street virus emulsion as the above test animals—0.25 cc. into the right masseter muscle. Five animals then received 12 daily doses of 2 cc. of the vaccine used in the above experiment, subcutaneously in the abdomen, and all animals were observed for 2 months and checked for Negri bodies at death. Eighty percent of the unvaccinated and 40 percent of the vaccinated animals died of rabies, showing the efficacy of the vaccine.

The results of the mouse inoculations with guinea pig tissues are shown in table 5. Control animals showed the presence of street virus in the blood, muscle, and sciatic nerve 2 days after the inoculation, in the muscle on the fourth day, and in the spinal cord and brain on the fourteenth day.

TABLE 5.—*Presence of street virus in tissues of guinea pigs*

Group	Days after street virus intramuscularly	Guinea pig number	Tissue emulsion injected intracerebrally in mice														
			Blood serum			Muscle			Sciatic nerve			Spinal cord			Brain		
Vaccinated	1	295	[1] 0	0	0	[2] S	S	0	S	S	S	S	S	S	S	S	[3] 14−
	2	296	S	S	S	S	S	35−	S	S	S	S	S	S	S	S	S
	4	297	6−	33−	0	S	0	24+	S	20−	0	S	S	S	S	S	18−
	7	298	S	S	S	S	S	0	S	S	S	S	S	S	S	S	S
	14	299	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Controls	1	292	0	0	0	0	0	0	S	S	S	S	S	S	S	S	S
	2	291	S	S	25+	16+	18+	40+	S	25+	25+	S	S	8−	S	S	S
	4	290	S	S	S	S	S	13+	S	S	S	S	S	S	S	S	S
	7	294	S	S	S	S	S	43−	S	S	S	S	S	S	S	S	S
	14	293	S	S	32−	S	S	31−	S	S	S	9+	9+	11+	12+	14+	15+

+ = Negri positive.
− = Negri negative.
[1] 0 = Traumatic death.
[2] S = Survived.
[3] Number = Day of death.

The guinea pigs receiving the vaccine had virus present in the muscle on the fourth day but otherwise all the other tissues were negative each time tested.

The blood serum removed at the time of killing the guinea pigs on the seventh and fourteenth days was then tested for the presence of virus-neutralizing antibodies. Table 6 shows that the serum of both the control and the vaccinated animals had an antibody titer of 10 M. L. D. on the seventh day and at least 100 M. L. D. on the fourteenth day.

TABLE 6.—*Serum neutralization titers in guinea pig experiment*

Sera	Dilution of fixed virus mixed with serum 0.03 cc. intracerebrally in mice			Number M. L. D. neutralization
	1:5,000	1:50,000	1:500,000	
Control guinea pig:				
7th day	[1]11 11 11 11	11 [2]S S S		10
14th day	S S S S	S S S S		100
Immunized guinea pig:				
7th day	10 10 10 S	S S S S		10
14th day	S S S S	12 S S S		100
Normal serum	8 9 9 10	9 11 11 12	11 11 S [3]0	

[1] Number = Day of death.
[2] S = Survived.
[3] 0 = Traumatic death.

DISCUSSION

In the mouse experiments on the progression of street virus centrally after its peripheral introduction, two facts are evident which must be considered in interpreting the results. First, the phenolized fixed virus was a poor immunizing agent as compared to the live virus; second, either the test mice were relatively insusceptible to peripheral infection with street virus or the strain of street virus used was not highly virulent.

However, these two objections do not apply to the guinea pig experiment where the phenolized vaccine was of high immunizing potency and the street virus virulent.

In the control animals in the two experiments, the street virus remained viable and perhaps multiplied in the muscle at the site of its inoculation for at least 4 days in spite of the fact that in the tissue neutralization test the muscle of the control rabbit was able to neutralize 100 M. L. D. of virus. The spread of virus in normal animals to the peripheral nerve, thence to the spinal cord, apparently occurred within 24 to 48 hours, whereas its progression in the central nervous system to the brain was more delayed.

Vaccinated animals that had an appreciable degree of immunity (mice immunized with live virus vaccine and guinea pigs) showed virus only at the site of injection in the muscle for as long as 4 days but at no time could it be demonstrated in the peripheral or central nervous system. Immunized rabbits had virus neutralizing properties in the

sciatic nerve and spinal cord but not in the brain, and the muscle tissue did not neutralize any more than did the controls.

These results in the *in vivo* mouse experiment (using post-vaccination infection), in the *in vivo* guinea pig experiment (using post-infection vaccination), and in the rabbit tissue neutralization experiment appear to be consistent in the controls and in the animals vaccinated with material of definite immunizing potency.

However, the results with the phenolized vaccine of known low potency are quite different. In the mice the street virus remained in the muscle but quickly invaded both the peripheral and central nervous systems and at a rate even greater than in the controls. Yet in the tissue neutralization experiment the rabbit immunized with this low potency vaccine had virus neutralizing properties in the sciatic nerve and brain. In view of the rapid spread of the street virus into the central nervous system in these mice, it is interesting that it has been our experience in several experiments with guinea pigs that where street virus was introduced peripherally, then immunization started with a vaccine known to be low in immunizing power, the incubation period has been shorter, and occasionally the mortality higher in the vaccinated than in the control animals.

It is difficult to interpret the role of the serum neutralizing antibodies in immunity to rabies. There was no difference in antibody titer between the control and immunized guinea pigs either on the seventh day or the fourteenth day. At the time the street virus was present in the cord and brain of the control animal its serum neutralized at least 100 M. L. D. Furthermore, in the rabbit tissue neutralization experiment there was no definite correlation between the serum antibody titers and the tissue resistance of the two rabbits.

SUMMARY

In normal mice and guinea pigs peripherally introduced street virus remained viable in the muscle for at least 4 days and invaded the nervous system within 24 to 48 hours.

In vaccinated mice and in guinea pigs being vaccinated the peripherally introduced street virus remained viable in the muscle but did not invade the nervous system.

In mice receiving a vaccine of low potency the spread of peripherally introduced street virus appeared to be increased.

There was no definite relationship between the development of serum neutralizing antibodies and immunity to actual infection.

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THE INCIDENCE OF CANCER IN DETROIT AND WAYNE COUNTY, MICHIGAN, 1937[1]

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This is the fourth of a series of papers concerning the incidence of cancer in the United States. The reader who has followed the three earlier studies of Atlanta, Chicago, and Pittsburgh (*1*, *2*, *3*) will recall that this survey attempts to determine certain facts about the incidence, prevalence, and the various distributions of malignant neoplasms. The procedure followed has been described in previous papers. Here, it is sufficient to point out that reports were collected from all doctors practicing in the area, and from all hospitals, concerning any malignant growth seen by them during the calendar year 1937. This method was used in each of the cities selected for the sampling survey.

The fourth area to be surveyed consisted of the city of Detroit, Michigan, and the remainder of Wayne County. The 1930 census gave a population of 1,888,946 for this county. There were 2,116 doctors and 101 hospitals in this area in 1937, and reports were secured from 2,053 of the doctors and from 99 of the hospitals.[2] Since 10 hospitals and 90 doctors submitted reports in conjunction with other hospitals and doctors, there were actually 89 separate reports from hospitals and 1,963 separate reports from doctors.

NUMBER OF CASES REPORTED

The total number of cases of malignant neoplasms seen or treated in Detroit[3] in 1937 was reported as 5,833. Of these, 2,224 cases were in males, and 3,609 in females; 5,373 were residents of Detroit and 460 were nonresidents. In addition to this number, 217 of the persons who died during the year with cancer listed on the death certificates as a cause of death were not reported in the 5,833 cases mentioned above. If these are included, 6,050 cases of cancer were obtained in the Detroit survey.

Table 1 gives the number of resident death certificates (including resident cancer death certificates which were not reported as cases) and the number of cases that were reported for residents. Because satisfactory population figures will not be available until the 1940

[1] From the Division of Public Health Methods, National Institute of Health.

The data for Wayne County were collected under the supervision of Miss Bess Cheney with the assistance of Miss Elizabeth Leighton. Miss Cheney also supervised the tabulation of the data. Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Project No. 65-2-23-356. The entire survey was under the direction of Harold F. Dorn.

[2] The two institutions listed as hospitals from which no reports were obtained were both small sanitoria. It is believed that if there had been any cases of cancer seen in these homes the number of cases would have been very small.

[3] "Detroit" will be used throughout this paper to designate this entire study area.

census data are released, the ratio of the total number of resident cancer cases to total resident cancer deaths has been used to make possible some comparisons of the relative prevalence[4] among the various cities. By applying this ratio to the cancer death rate for 1930, it is possible to obtain a prevalence rate based only on the assumption that the cancer death rate has not changed from 1930 to 1937. Since the rate increases slowly this will give a conservative approximation of the real rate. The ratio for total resident cases was 3.2 cases per death. This is slightly higher than the similar ratios in Pittsburgh (2.9) and in Chicago (2.6), but considerably lower than the Atlanta ratio of 5.3. It will be noted that this ratio is significantly higher for females than for males and is higher for white than for colored persons. Since the 1930 cancer death rate in Detroit was 73.9 per 100,000 population, the prevalence rate may be approximated by applying the above ratio (3.2), giving at least 236 cases per 100,000 population.

TABLE 1.—*Number of reported cases and recorded deaths from cancer, with the ratio of total resident cases to resident deaths, by sex and color, Wayne County, Mich., 1937*

	Number of individual cases or deaths								
	Total			White			Colored		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Reported cases	5,833	2,224	3,609	5,599	2,159	3,440	234	65	169
Deaths from cancer [1]	1,981	917	1,064	1,867	872	995	114	45	69
Reported as a case	1,764	820	944	1,661	781	880	103	39	64
Not reported as a case	217	97	120	206	91	115	11	6	5
Total resident cases [2]	5,590	2,143	3,447	5,346	2,072	3,274	244	71	173
Resident death certificates	1,726	801	925	1,623	762	861	103	39	64
Ratio (resident cases per resident death)	3.2	2.7	3.7	3.3	2.7	3.8	2.4	1.8	2.7

[1] From Bureau of Vital Statistics.
[2] Includes resident cases from death certificate only, as well as all reported resident cases.

The ratio of total resident cases to resident deaths used here is only one of numerous ratios that might be computed. For comparisons among various cities the ratio of resident cancer cases treated in 1937 (excluding the reported cases which were only under observation) to resident deaths would have certain advantages. It would not be affected by the varying thoroughness with which cases of cancer are followed up subsequent to treatment, and it would avoid the relatively greater underreporting of cases under observation. This particular ratio for Detroit is 2.4. Figures for the cities previously surveyed are: Atlanta, 4.0, Chicago, 2.3, and Pittsburgh, 2.4.

[4] Strictly speaking, "prevalence" of a disease refers to the number of persons in the population who have the disease at some one particular time. The ratios used here are based on the total number of persons seen with cancer during one year, whether or not first discovered in the year or dying in the year. However, cancer is a chronic disease and the proportion of the population afflicted does not vary greatly within short periods of time.

It should be recognized that a comparison of prevalence in various cities by using the ratio of cases to deaths has a number of limitations. It fails to allow for variations in total death rates among the cities being compared, and it fails to take into account the particular distribution of the cases among sites (i. e., the parts of the body affected by the malignant growth) of widely varying fatality. In addition, it is subject to whatever variations may exist among the cities in the completeness with which the cases were reported. That such underreporting does exist is clearly recognized and the reasons for it, as well as attempted estimates of its extent, have been discussed in an earlier paper (*3*). One thing can be said definitely: the prevalence of cancer here established is a minimum, and the actual existing number of cases is greater than the number reported in these surveys.

DUPLICATIONS IN REPORTING

The amount of underreporting would be definitely higher were it not for the fact that reports were sought from all the sources that might have seen any particular patient. As a result of this method, cases were found to have been reported by only one doctor or hospital which may actually have been seen and which should have been reported by two or more such sources. But even though one source failed to report such a case, it was included in the survey if it was reported by another source. While the failure of a physician to report a case will minimize the amount of duplication, it will not affect the total number of cases unless that particular case happens to be reported by no one else. Since there was a great deal of duplication in the reporting—all of which was eliminated before the figure of 5,833 was obtained—it is clear that the error of underreporting would have been much greater had it not been for the method of collecting reports from all sources.

The extent of duplication in the reporting is shown in table 2 and appendix table 2. About 20 percent of the cases were reported by more than one source, and 3.6 percent were reported by three or more sources. This is considerably less duplication than was found in two of the three cities already surveyed. The third city (Atlanta) had an even lower percentage of duplicated cases, but in that area there was a high proportion of skin cancers, many of which are seen by one source only. Just why malignant growths are seen by only one source more often in Detroit than in other cities is not immediately apparent. The explanation may be in the local facilities available.

TABLE 2.—*Percentage of cases reported by various sources, by number of sources, and by sex and color, Wayne County, Mich., 1937*

Reported by	Percent of cases								
	All cases combined	Both sexes by color		All colors by sex		White		Colored	
		White	Colored	Male	Female	Male	Female	Male	Female
Nature of source									
Doctor(s) only	27.7	28.4	10.3	25.6	29.0	26.2	29.8	7.7	11.2
One doctor only	*26.3*	*27.0*	*9.4*	*24.5*	*27.5*	*25.0*	*28.3*	*7.7*	*10.1*
Hospital(s) only	58.8	58.0	79.9	62.7	56.5	62.0	55.4	86.2	77.5
One hospital only	*54.2*	*53.6*	*68.4*	*58.0*	*51.8*	*57.4*	*51.2*	*78.5*	*64.5*
Doctor and hospital	13.5	13.6	9.8	11.7	14.6	11.8	14.7	6.2	11.2
Any combination of sources	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of sources									
One source only	80.5	80.6	77.8	82.5	79.3	82.4	79.5	86.2	74.6
Two sources only	15.9	15.8	16.2	14.2	16.9	14.4	16.8	9.2	18.9
Three or more sources	3.6	3.5	6.0	3.3	3.9	3.2	3.7	4.6	6.5
Any number of sources	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

REPORTING SOURCE

Table 2 also shows the percentages of all cases that were reported by doctors, hospitals, or both. Nearly 59 percent of the cases were seen by hospitals only; 54 percent were seen by one hospital only. Doctors alone reported almost 28 percent of the cases, while the remaining 13 percent were reported by both doctor and hospital. There is considerable difference in the proportions reported by doctors and by hospitals when the data are considered according to color. Twenty-eight percent of the cases among white persons were reported by doctors only, and an additional 14 percent by doctors and hospitals, making a total of 42 percent reported by doctors. Only 10 percent of cases among colored persons were seen by doctors only and slightly less than 10 percent by doctors and hospitals. Only 20 percent of the cases among colored persons were reported by a doctor—less than half as many as among white persons.

TABLE 3.—*Percentage of cases reported by various sources for each primary site group, with percentage of cases that were reported only once, Wayne County, Mich., 1937*

Primary site	Percent unduplicated	Percent reported by—		
		Doctor(s) only	Hospital(s) only	Doctor(s) and hospital(s)
Buccal cavity	84.6	24.7	66.4	8.9
Digestive tract	82.2	31.7	55.3	13.0
Respiratory system	80.6	21.1	62.4	16.5
Genitourinary system	76.6	25.5	59.5	15.0
Breast	75.5	26.4	55.2	18.4
Skin	91.4	30.3	65.2	4.5
Brain	94.1	45.6	50.0	4.4
Bones	83.1	25.2	64.2	10.5
All others	85.5	28.6	61.8	9.6
All sites	80.5	27.7	58.9	13.4

The extent of duplication and the extent to which the cases were reported by a particular source are shown in table 3 and appendix table 3 for 9 groups of primary sites. Certain sites (notably breast and genitourinary) are duplicated more often than are all sites combined, while malignant growths of the brain, skin, and buccal cavity are more frequently reported by one source only.

SPECIALIZATION IN FIELD OF CANCER TREATMENT

The number and percentage of sources reporting any specific number of cases appear in table 4 and appendix table 4. It is seen that 57 percent of the sources reported having had no case of cancer in 1937 (57.8 percent for doctors; 40.5 percent for hospitals). One case only was reported by 20.6 percent of the doctors and by 6.7 percent of the hospitals; 1.4 percent of the doctors and 32.6 percent of the hospitals reported over ten cases of cancer; and only 0.5 percent of the doctors and 23.6 percent of the hospitals reported having had more than twenty cases of malignant tumors during the year.

Let us consider the proportion of all cases reported that each of these groups (the one-case group, etc.) contributed, in relation to the number of doctors (or hospitals) in that group. The 20.6 percent of the doctors each of whom reported only one case accounted for only 15.5 percent of all the cases reported by doctors, while the 6.7 percent of the hospitals, each with one case, reported 0.1 percent of all the hospital cases. If we combine with these the sources reporting no cases we see that 78.4 percent of the doctors had each seen less than two cases of malignant neoplasm and that the reports of these doctors accounted for only 15.5 percent of the total number of cases reported by doctors. Less than two cases each were reported by 47.2 percent of the hospitals, constituting only 0.1 percent of all cases reported by hospitals.

TABLE 4.—*Percentage distribution of reporting sources by number of cancer cases reported, with the corresponding percentage distribution of cases, Wayne County, Mich., 1937*

Number of cases reported by each source	All sources		Doctors		Hospitals	
	Percent of all sources reporting	Percent of all cases reported	Percent of all sources reporting	Percent of all cases reported	Percent of all sources reporting	Percent of all cases reported
No cases	57.0	0	57.8	0	40 5	0
One or more cases	43 0	100	42.2	100	59 5	100
One case	*20 0*	*5 5*	*20 6*	*15 5*	*6 7*	*.1*
Two to five cases	*17 3*	*13.7*	*17.4*	*37 7*	*13 5*	*.8*
Six to ten cases	*2 9*	*5.9*	*2.7*	*15.2*	*6.7*	*1 0*
Eleven to twenty cases	*1.3*	*4.8*	*1.0*	*9 4*	*9 0*	*2.3*
Over twenty cases	*1.5*	*70.1*	*.5*	*22.2*	*23.6*	*95.8*
Total reporting	100.0	100.0	100.0	100.0	100.0	100.0

At the other end of the range are the 1.5 percent of the doctors, and 32.6 percent of the hospitals each reporting over 10 cases. These doctors accounted for 31.6 percent of all cases reported by doctors, and these hospitals for 98.1 percent of all cases reported by hospitals. The process of concentration is carried still further if we consider those reports listing over 20 cases each. Only 0.5 percent of the doctors are in this group but they contributed over one-fifth of all cases reported by doctors. Of the total number of hospital cases 95.8 percent were reported by 23.6 percent of the hospitals.

It is seen that malignant neoplasms tend to be treated by a relatively small number of doctors and hospitals. In Detroit, 30 reports (9 doctors and 21 hospitals), out of the 2,052 received, included 5,248 cases of the total of 7,481 (duplicated and unduplicated). The principal reasons for this are that a large number of doctors specialize in a particular field (such as pediatrics, neuropathology, etc.) in which cancer is relatively rare, and a number of institutions likewise are devoted to some particular field (as nursing homes, tuberculosis sanatoriums, mental hospitals, etc.). Then, too, the nature of cancer treatment is such that the relatively few persons who accept such cases (dermatologists, surgeons, roentgenologists, and radiologists) become specialists in the field.

CONFIRMATION OF DIAGNOSES

In these cancer incidence surveys the diagnosis of the reporting hospital or doctor determined whether the case was classed as a malignant growth. Cases in which only a clinical diagnosis had been made were accepted. However, a record was made of whether or not the diagnosis had been confirmed by a microscopic examination of the tissue; in 78 percent of all the cases in Detroit such an examination was reported. The proportion of diagnoses made by biopsy (or necropsy) varied with the site, being highest in sites easily accessible, such as breast, genitourinary system, and buccal cavity, and lowest in sites such as respiratory system, digestive tract, and brain. (Skin cancers, where a biopsy often would disfigure, are the exception to this.) The proportion of microscopic examinations made among the Detroit cases was definitely higher than in any of the cities previously surveyed. (The figure for Detroit was 78 percent, while the percentages for Atlanta, Chicago, and Pittsburgh were, respectively, 52, 70, and 62.) This is true throughout the various sites and for cases reported only by a doctor as well as for cases reported by a hospital..

DISTRIBUTION OF CASES BY PRIMARY SITE

There were marked differences in the distribution of the cases of cancer among the various sites. As in the other cities surveyed, the sites that were most frequent among males were not the same as those

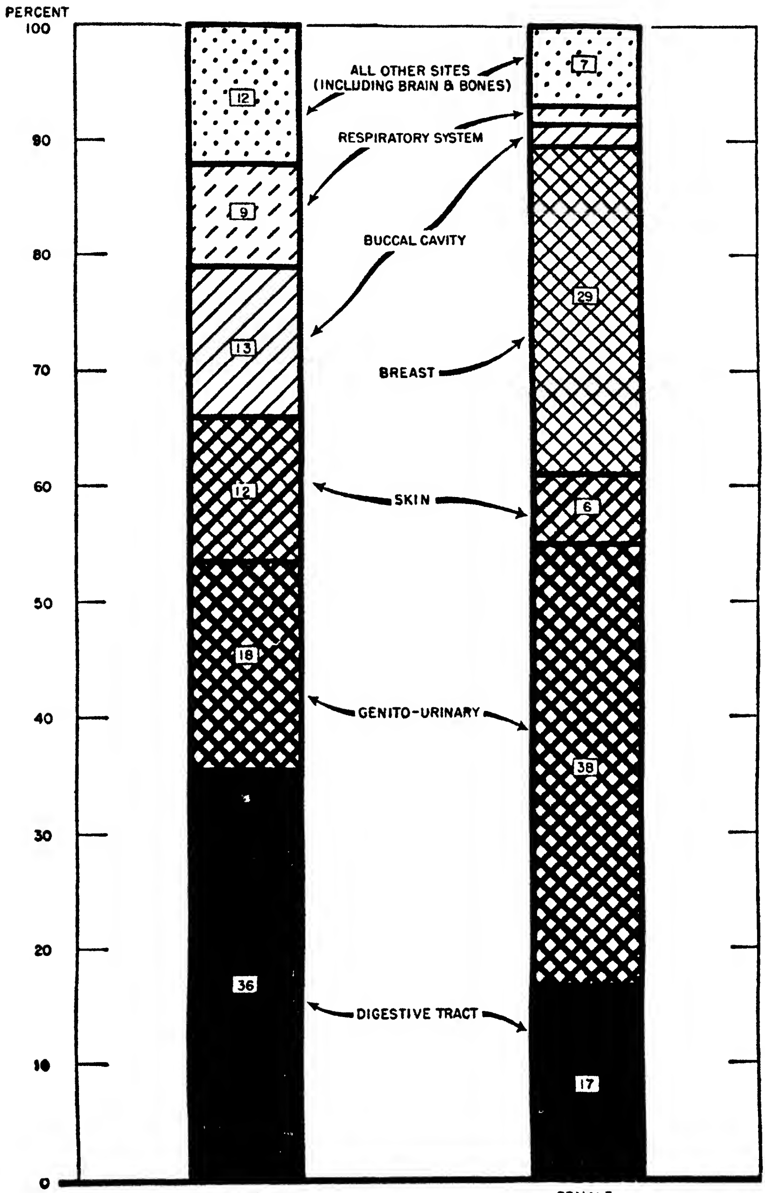

FIGURE 1.—Percentage distribution of cases of cancer by primary site, for males and for females, Wayne County, Mich., 1937.

most frequent among females. For males, 36 percent of the cases were in the digestive tract, 18 percent were primary in the genito-urinary system, and 25 percent were cancers of either skin or buccal cavity. For females, however, only 8 percent of the cases were malignant growths of the skin or buccal cavity, 17 percent were

primary in the digestive tract, while 38 percent were primary in the genitourinary system. Genitourinary cancers, along with carcinoma of the breast, constituted 67 percent of the total number of cases among females.

TABLE 5.—*Percentage of all cancer cases with a microscopically confirmed diagnosis, by primary site, and whether reported by a hospital, Wayne County, Mich., 1937*

Primary site	Percent of cases diagnosed microscopically		
	All reports	Reported by doctor only	Hospital reports
Buccal cavity	82.9	62.5	89.6
Digestive tract	63.8	50 0	70 2
Respiratory system	64.0	60 8	64.9
Genitourinary system	85 5	73 7	89.5
Breast	87.1	72.5	92.4
Skin	77 3	48.7	89 7
Brain	70.6	61.3	78 4
Bones	76 8	66 7	80.3
All others	77.8	65.4	82.8
All sites	78.0	62.8	83.9

[1] This group includes both cases on which the only report was from a hospital and cases reported by both hospital and doctor.

Table 6 and appendix table 6 list the numbers and percentages of cases for many specific sites, as well as for the broad groups of sites used in the earlier papers.

TABLE 6.—*Percentage distribution of reported cases of cancer by sex, color, and primary site, Wayne County, Mich., 1937*

Primary site	Total		White [1]	
	Male	Female	Male	Female
Buccal cavity	13.1	1.9	13.4	1 9
Lip	7.0	.3	7 1	6.3
Tongue	1.9	.2	2 0	.3
Mouth	1.0	.2	1.	.2
Jaw	.6	.2	.7	.2
Pharynx	.6	.1	.6	.1
Others	2.0	.9	2 0	.8
Digestive tract	35.8	16.7	35.4	16 9
Esophagus	1.8	.5	1.8	.4
Stomach, duodenum	14.7	4.3	14.6	4 4
Intestines	7.6	4 9	7 6	4 9
Rectum, anus	7.4	4.0	7.3	4 1
Liver, biliary passage	1.9	1 8	1.9	1.9
Pancreas	1.8	1.0	1.6	1.0
Mesentery, peritoneum	.6	.2	.6	.2
Respiratory system	8.7	1 3	8.6	1.3
Larynx	2.0	.3	2.0	.3
Lungs, pleura	6.5	.9	6.4	.9
Others	.2	.1	.2	.1
Genitourinary system	17.6	38.3	17.7	37.6
Uterus	----------	30.5	----------	29.8
Kidneys	2.3	.7	2.3	.7
Bladder	4.4	1.5	4 5	1.6
Prostate	8.7	----------	8.7	----------
Others	2.2	5.6	2.2	5.5
Breast	.1	28.6	.1	28.8
Skin	12.2	6.0	12.3	6.2
Brain	2.1	.6	2.2	.6
Bones	2.7	1 0	2.5	1.0
Others	7.7	5.6	7.8	5.7
Total	100.0	100.0	100.0	100.0

[1] Because of the small number of cases reported among colored persons, the percentage distribution was not computed.

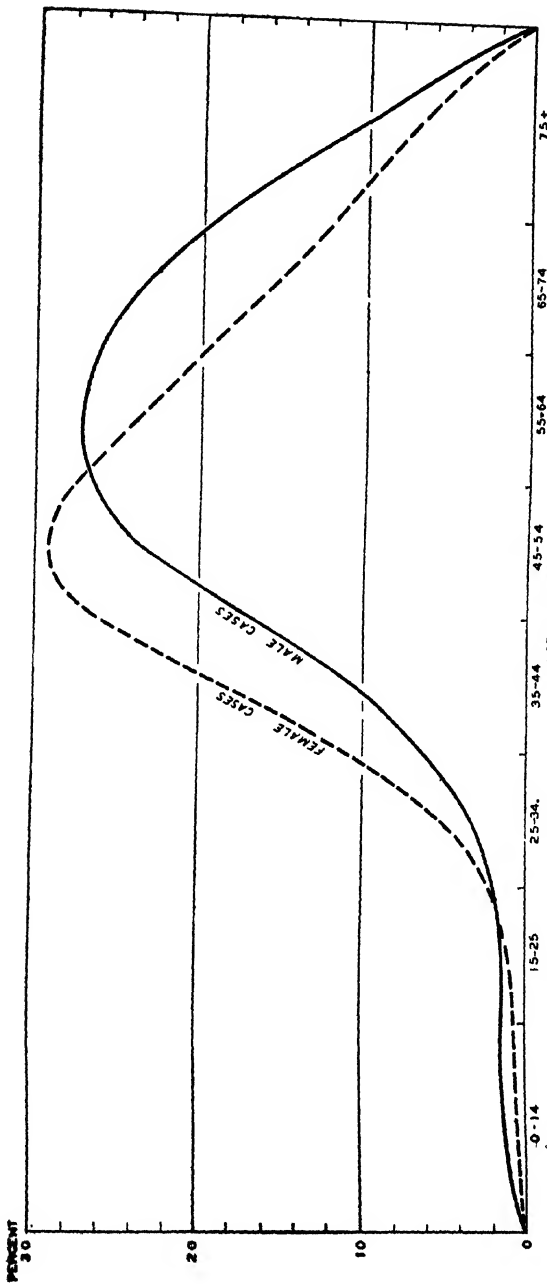

FIGURE 2.—Percentage distribution of cases of cancer by age of patient, for males and for females, Wayne County, Mich., 1937.

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DISTRIBUTION OF CASES BY PATIENT'S AGE

There were 1,222 cases of malignant neoplasm among persons under 45 years of age, representing 22 percent of all the cases of known age. Ninety-eight persons, nearly 2 percent of the total number, were under 25 years of age. These figures are for both sexes combined. There are differences in age distribution between cases in males and females. As in the cities already studied, the female cases are relatively concentrated in the ages from 35 to 55. Over 47 percent of all cases among females are in those groups, as compared with only 33.4 percent of the male cases. Of the total cases, 26.7 percent (34.6 percent for males and 22.5 percent for females), occurred in persons who were 65 years of age or older.

TABLE 7.—*Number and percentage of cases of cancer of known age, by age and sex, Wayne County, Mich., 1937*

Age group	Percent of cases						Number of cases		
	In each age group			In or below each age group			Total	Male	Female
	Total	Male	Female	Total	Male	Female			
Under 15	0.7	1.3	0.3	0.7	1.3	0.3	40	28	12
15-24	1.0	1.3	.9	1.7	2.6	1.2	58	28	30
25-34	4.5	3.3	5.2	6.2	5.9	6.4	255	72	183
35-44	15.3	10.2	18.4	21.5	16.1	24.8	869	223	646
45-54	26.8	23.2	29.1	48.3	39.3	53.9	1,529	507	1,022
55-64	25.0	27.1	23.6	73.3	66.4	77.5	1,422	591	831
65-74	18.3	23.4	15.2	91.6	89.8	92.7	1,013	510	533
75 and over	8.4	10.2	7.3	100.0	100.0	100.0	479	224	255
All known ages	100.0	100.0	100.0				[1] 5,695	2,183	3,512

[1] One hundred and thirty-eight cases (40 male, 98 female) of unknown age are excluded.

DISTRIBUTION BY AGE AND PRIMARY SITE

An examination of the age distributions of cases in each of the different site groups reveals distinct differences among the sites. Because the site distributions are different for males and females, the cases are considered separately by sex in tables 8 and 9. For only two sites, brain and bones, was a major portion of cases in the age groups under 45 years of age. Among males 64.4 percent of the malignant tumors of the brain were found in the age groups under 45; for females the percentage is 47.4. Among males 48.3 percent of the malignant growths primary in the bones occurred in persons under 45, while among females exactly 50 percent of the bone cancers were in that group. For all sites combined, only 16.1 percent of the cases among males and 24.8 percent of those among females were in persons under 45 years of age. Cancer of the skin is found especially frequently among persons of older age; 42.1 percent of the cases among males and 42.3 percent of those among females are in the age groups 65 and

over. Only 22.5 percent of the total cases among females (regardless of site) and 33.6 percent of those among males are in these age groups. Cancer of the prostate likewise occurs principally in older males. The other sites tend to follow the same distribution as do all sites combined, with the exception of the respiratory system. Malignant growths primary in the respiratory system tend to be concentrated in the late middle section of the life span, from 45 to 64 years. For males 60.1 percent of all such cases and for females 69.6 percent were in these age groups.

TABLE 8.—*Percentage distribution of reported cases of cancer by age, for each site of malignant growth, males only, Wayne County, Mich., 1937*

Primary site	Percentage in each age group									Number of cases
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	All known ages	
Buccal cavity			3.9	7.4	24.6	32.6	18.9	12.6	100	285
Lip			*4.6*	*5.3*	*27.8*	*27.2*	*22.5*	*12.6*	*100*	*151*
Others			*3.0*	*9.7*	*20.9*	*38.8*	*14.9*	*12.7*	*100*	*134*
Digestive tract	0.1	0.8	2.4	11.4	22.9	29.7	24.0	8.6	100	780
Stomach		*.3*	*.9*	*11.5*	*23.4*	*31.2*	*24.9*	*7.8*	*100*	*321*
Intestines		*.6*		*14.1*	*20.2*	*26.4*	*27.6*	*11.0*	*100*	*163*
Rectum		*1.2*	*5.0*	*9.3*	*31.1*	*28.6*	*17.4*	*7.4*	*100*	*161*
Others	*.7*	*1.5*	*5.9*	*10.4*	*15.6*	*31.8*	*25.2*	*8.9*	*100*	*135*
Respiratory system		2.1	2.1	12.4	32.1	28.0	17.6	5.7	100	193
Lungs		*2.8*	*2.8*	*14.0*	*34.2*	*28.7*	*13.3*	*4.2*	*100*	*143*
Others				*8.0*	*26.0*	*20.0*	*30.0*	*10.0*	*100*	*50*
Genitourinary system	1.3	.5	3.2	6.0	17.6	24.6	31.6	15.3	100	386
Prostate				*3.7*	*9.4*	*22.0*	*45.5*	*19.4*	*100*	*191*
Others	*2.6*	*1.0*	*6.2*	*8.2*	*25.6*	*27.2*	*17.9*	*11.3*	*100*	*195*
Skin	1.5	.4	1.1	9.4	22.6	22.9	26.3	15.8	100	266
Brain	22.2	2.2	17.8	22.2	22.2	11.1	2.2		100	45
Bones	5.2	17.2	12.1	13.8	24.1	10.3	15.5	1.7	100	58
All others [1]	2.9	2.4	4.7	13.5	25.9	26.5	19.4	4.7	100	170
All sites	1.3	1.3	3.3	10.2	23.2	27.1	23.3	10.3	100	[2] 2,183

[1] Includes 3 cases of breast cancer, too few for separate tabulation.
[2] Forty cases of unknown age have been excluded from this table.

TABLE 9.—*Percentage distribution of reported cases of cancer by age, for each site of malignant growth, females only, Wayne County, Mich., 1937*

Primary site	Percentage in each age group									Number of cases
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	All known ages	
Buccal cavity	1.6	3.1	7.8	18.8	18.7	17.2	20.3	12.5	100	64
Digestive tract		.5	3.9	11.6	23.3	26.6	20.6	13.5	100	584
Stomach		*.7*	*3.3*	*8.5*	*18.3*	*30.7*	*21.5*	*17.0*	*100*	*153*
Intestines		*.6*	*5.8*	*17.9*	*23.1*	*22.0*	*16.7*	*13.9*	*100*	*173*
Rectum		*.7*	*5.8*	*10.9*	*29.2*	*26.3*	*16.8*	*10.2*	*100*	*137*
Others				*7.4*	*23.1*	*28.2*	*28.9*	*12.4*	*100*	*121*
Respiratory system		4.3	8.7	8.7	41.3	28.3	8.7		100	46
Genitourinary system	.2	.4	5.4	22.8	30.9	23.5	12.9	3.9	100	1,360
Uterus		*.2*	*4.7*	*23.1*	*32.2*	*24.8*	*11.1*	*3.9*	*100*	*1,080*
Others	*1.1*	*1.4*	*7.9*	*21.8*	*25.7*	*18.6*	*19.6*	*3.9*	*100*	*280*
Breast		.3	4.5	18.1	33.6	23.5	13.8	6.2	100	1,005
Skin	.5	1.0	3.4	13.1	17.0	22.8	20.9	21.4	100	206
Brain	5.3		15.8	26.3	31.6	15.8	5.3		100	19
Bones		8.3	11.1	30.6	11.1	30.6	8.3		100	36
All others	3.1	4.7	9.9	14.1	27.1	18.2	18.2	4.7	100	192
All sites	.3	.9	5.2	18.4	29.1	23.7	15.2	7.3	100	3,512

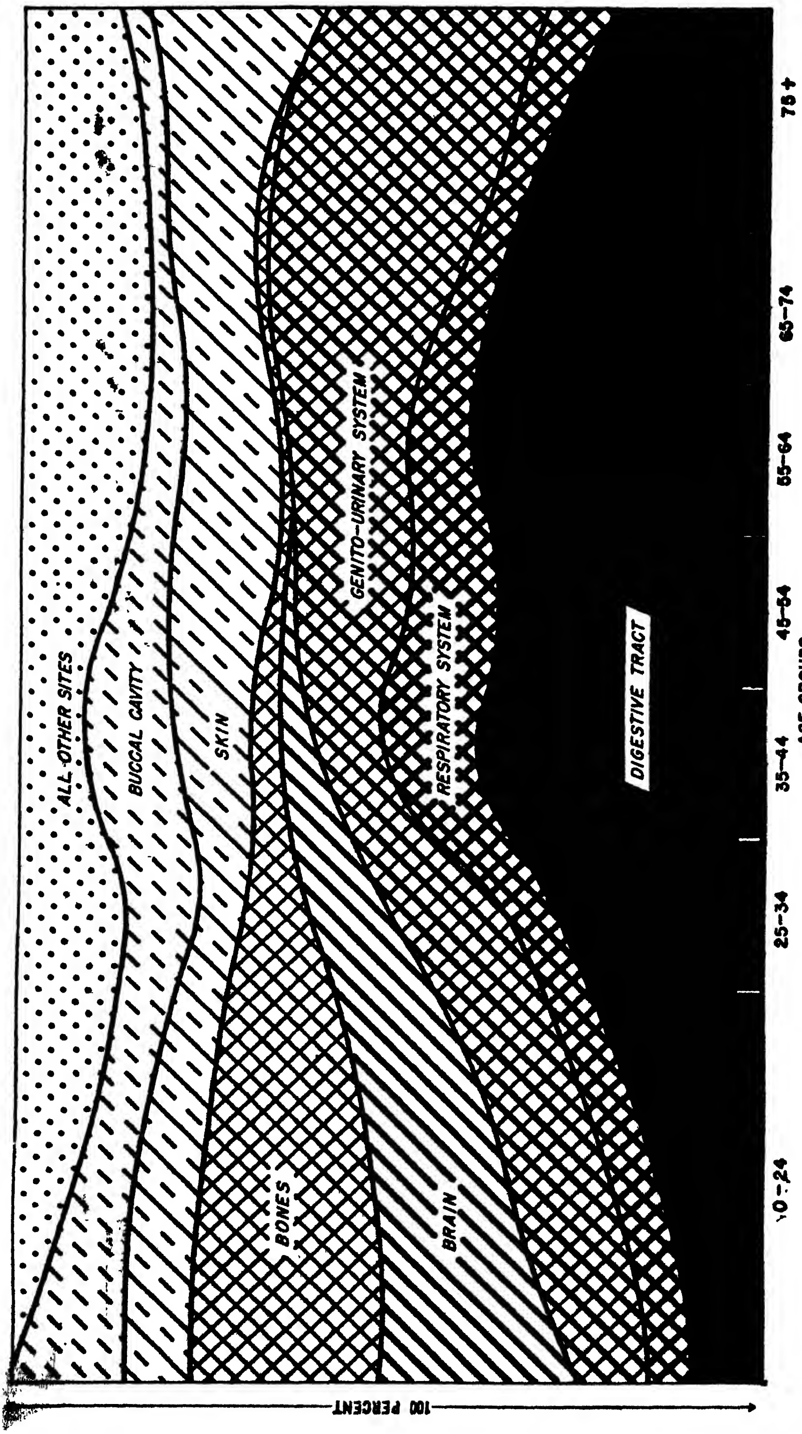

Figure 3.—Percentage distribution at each age group of cases of cancer, by primary site, for males, Wayne County, Mich., 1937.

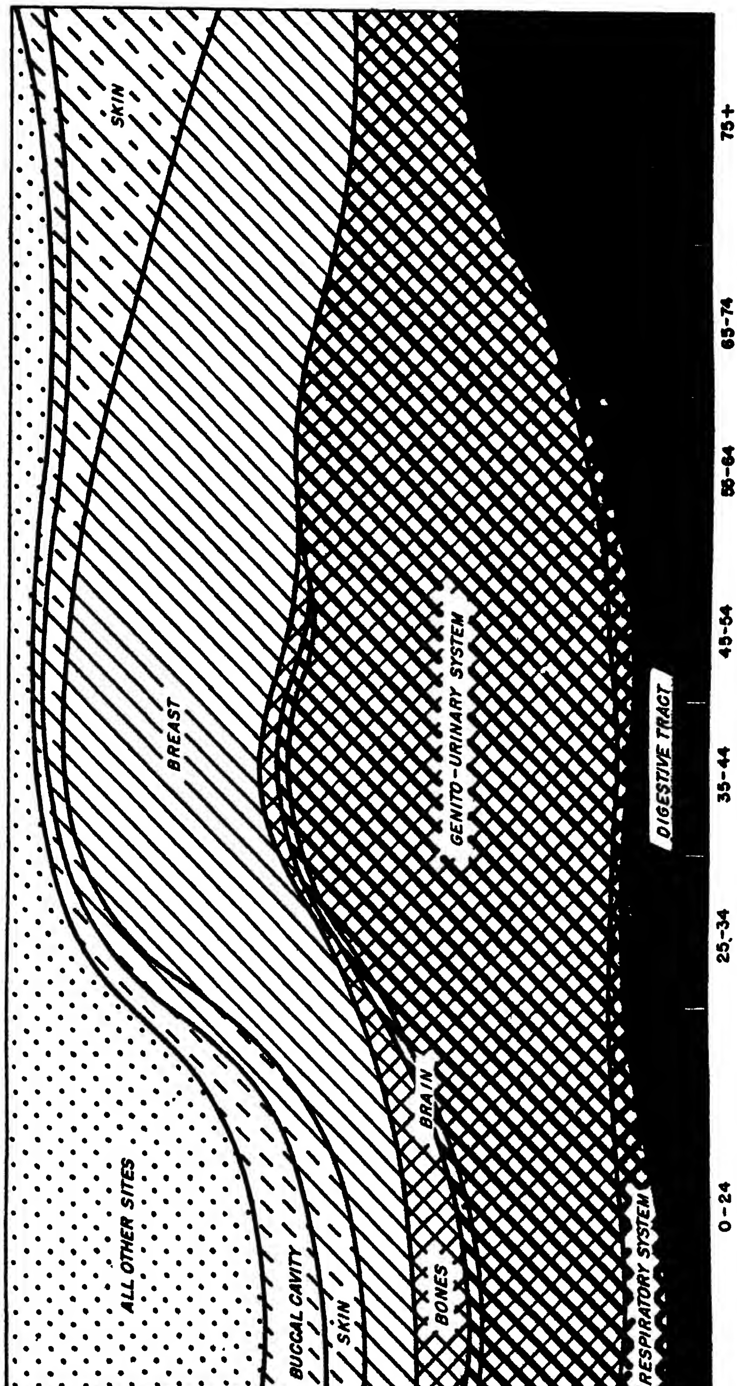

FIGURE 4.—Percentage distribution at each age group of cases of cancer by primary site, for females, Wayne County, Mich., 1937.

These same data may be examined from another viewpoint by investigating, for each particular age group, the order of importance of the various sites (tables 10 and 11). In the first age group, under 25 years, brain and bones each account for about one-fifth of all the male cases, ten times the percentage they constitute at all ages combined. Cancers of the digestive tract constitute roughly one-third of all the male cases in each age group after the age of 25. Skin, buccal cavity, and genitourinary cases become increasingly important among males at the older ages. Respiratory cancer makes up about 12 percent of the cases in the age group 45 to 54 and decreases in importance in both younger and older age groups. For females, only three sites make up a considerable portion of the cases, genito-urinary, breast, and digestive tract. The first two are most important in the age groups from 25 to 75 years, while the third becomes gradually more important with increase in age. Figures 3 and 4 show the order of importance of the sites at various ages.

TABLE 10.—*Percentage distribution of reported cases of cancer by primary site, for each age group, males only, Wayne County, Mich., 1937*

Primary site	Percentage distribution							
	Under 25	25–34	35–44	45–54	55–64	65–74	75 and over	All ages
Buccal cavity	-------	15.3	9.4	13.8	15.7	10.6	16.1	13.0
Lip	-------	*9.7*	*3.6*	*8.3*	*6.9*	*6.7*	*8.5*	*7.0*
Others	-------	*5.6*	*5.8*	*5.5*	*8.8*	*3.9*	*7.6*	*6.0*
Digestive tract	12.5	26.4	39.9	35.3	39.3	36.7	29.9	35.8
Stomach	*1.8*	*4.2*	*16.6*	*14.8*	*16.9*	*15.7*	*11.2*	*14.7*
Intestines	*1.8*	-------	*10.3*	*6.5*	*7.3*	*8.8*	*8.0*	*7.5*
Rectum	*3.6*	*11.1*	*6.7*	*9.9*	*7.8*	*5.5*	*5.4*	*7.4*
Others	*5.3*	*11.1*	*6.3*	*4.1*	*7.3*	*6.7*	*5.3*	*6.2*
Respiratory system	7.1	5.6	10.8	12.2	9.1	6.6	4.9	8.8
Lungs	*7.1*	*5.6*	*9.0*	*9.7*	*6.9*	*3.7*	*2.7*	*6.5*
Others	-------	-------	*1.8*	*2.5*	*2.2*	*2.9*	*2.2*	*2.3*
Genitourinary system	12.5	16.7	10.3	13.4	16.1	23.9	26.3	17.6
Prostate	-------	-------	*3.1*	*3.5*	*7.1*	*17.0*	*16.5*	*8.7*
Others	*12.5*	*16.7*	*7.2*	*9.9*	*9.0*	*6.9*	*9.8*	*8.9*
Skin	8.9	4.2	11.2	11.8	10.3	13.7	18.7	12.2
Brain	19.6	11.1	4.5	2.0	.8	.2	-------	2.1
Bones	23.2	9.7	3.6	2.8	1.0	1.8	.4	2.7
All others	16.1	11.1	10.3	8.7	7.6	6.5	3.6	7.8
All sites	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	56	72	223	507	591	510	221	[1] 2,223

[1] Includes 40 cases of unknown age. (Actual numbers on which this table is based are given in appendix table 8.)

TABLE 11.—*Percentage distribution of reported cases of cancer by primary site for each age group, females only, Wayne County, Mich., 1937*

Primary site	Percentage distribution							
	Under 25	25-34	35-44	45-54	55-64	65-74	75 and over	All ages
Buccal cavity	7.2	2.7	1.9	1.2	1.3	2.4	3.1	1.9
Digestive tract	7.2	12.6	10.5	13.3	18.7	22.5	31.0	16.7
Stomach	*2.4*	*2.7*	*2.0*	*2.7*	*5.7*	*6.2*	*10.2*	*4.3*
Intestines	*2.4*	*5.5*	*4.8*	*3.9*	*4.6*	*5.4*	*9.4*	*4.9*
Rectum	*2.4*	*4.4*	*2.3*	*3.9*	*4.3*	*4.3*	*5.5*	*4.0*
Others			*1.4*	*2.7*	*4.1*	*6.6*	*5.9*	*3.5*
Respiratory system	4.8	2.2	.6	1.9	1.6	.8		1.3
Genitourinary system	21.4	39.9	48.0	41.1	38.5	32.8	20.8	38.3
Uterus	*4.8*	*27.9*	*38.5*	*34.1*	*32.2*	*22.5*	*16.5*	*30.5*
Others	*16.6*	*12.0*	*9.5*	*7.0*	*6.3*	*10.3*	*4.3*	*7.8*
Breast	7.1	24.6	28.1	33.0	28.4	26.0	24.3	28.6
Skin	7.1	3.8	4.2	3.4	5.7	8.1	17.3	6.0
Brain	2.4	1.6	.8	.6	.3	.2		.6
Bones	7.1	2.2	1.7	.4	1.3	.6		1.0
All others	35.7	10.4	4.2	5.1	4.2	6.6	3.5	5.6
All sites	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases	42	183	646	1,022	831	533	255	[1] 3,610

[1] Includes 98 cases of unknown age. (Actual numbers on which this table is based are given in appendix table 9.)

RELATIVE FATALITY OF CANCER OF DIFFERENT PRIMARY SITES

There is a great difference in the relative fatality of malignant growths of the various sites. Carcinoma of the breast, for example, is relatively less fatal than malignant neoplasm primary in the stomach. In table 12 the percentage distribution of all of the cancer cases reported is compared with the percentage distribution of all cancer deaths. This shows the varying fatality among the several sites, for if cancer of a certain site is relatively more fatal than for all sites combined it will account for a larger percentage of the deaths than of the cases. Thus digestive tract cancers, which make up 35 percent of all cases among males, account for 55 percent of the deaths. Conversely, a site which is less fatal than the average will represent a less important part of the deaths than of the cases. Skin cancers make up 12 percent of the cases among the males but only 1 percent of the deaths. For both males and females the sites with the highest fatality are digestive tract and respiratory system, while those with the lowest fatality are skin and breast (for females only)

TABLE 12.—*Percentage distribution of all cancer deaths (including deaths obtained from death certificates only), and of all cancer cases reported, by sex, color, and primary site, Wayne County, Mich., 1937*

Primary site	White				Total			
	Male		Female		Male		Female	
	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases
Buccal cavity	5.6	12.2	1.1	1.2	5.5	11.9	1.1	1.1
Lip	.8	7.1	.2	.3	.7	7.0	.2	.3
Tongue	1.4	2.0	.2	.3	1.3	1.9	.2	.2
Mouth	1.1	1.0	.1	.2	1.1	1.0	.1	.2
Jaw	.9	.6	.4	.2	.9	.6	.4	.2
Pharynx	.5	.5	.2	.1	.6	.5	.2	.1
Other buccal	.9	1.0	-----	.1	.9	.9	-----	.1
Digestive tract	55.3	35.4	39.5	16.9	55.6	35.8	38.6	16.7
Esophagus	3.7	1.8	.9	.4	3.9	1.8	1.1	.5
Stomach, duodenum	26.3	14.5	13.4	4.4	25.9	14.7	13.3	4.3
Intestines	8.7	7.6	10.1	4.9	8.7	7.6	9.7	4.9
Rectum, anus	7.2	7.3	5.4	4.1	7.3	7.4	5.4	4.0
Liver, biliary passage	4.7	1.9	6.3	1.9	4.6	1.9	6.0	1.8
Pancreas	4.2	1.7	2.7	1.0	4.6	1.8	2.5	1.0
Other digestive	.5	.6	.7	.2	.6	.6	.6	.2
Respiratory system	13.3	8.6	2.7	1.3	13.4	8.8	2.6	1.3
Larynx	2.3	2.0	.2	.3	2.4	2.0	.2	.3
Lungs, pleura	8.3	5.2	1.8	.7	8.3	5.4	1.7	.7
Other	2.7	1.4	.7	.3	2.7	1.4	.7	.3
Genitourinary system	15.2	17.7	31.1	37.5	14.9	17.6	32.5	38.2
Uterus	-----	-----	23.0	29.8	-----	-----	24.5	30.5
Kidneys	2.7	2.3	.7	.7	2.5	2.3	.7	.7
Bladder	4.2	4.5	2.3	1.6	4.0	4.4	2.1	1.5
Prostate	7.5	8.7	-----	-----	7.7	8.7	-----	-----
Other genital	.5	1.3	5.1	5.4	.5	1.3	5.2	5.5
Other urinary	.3	.9	-----	-----	.2	.9	-----	-----
Breast	.4	.1	16.8	28.8	.5	.1	16.8	28.6
Skin	1.3	12.4	.2	6.2	1.2	12.2	.2	6.0
Brain	1.0	2.2	.7	.6	1.0	2.1	.7	.6
Bones	1.5	2.5	.6	1.0	1.4	2.7	.5	1.0
All others	6.4	8.9	7.3	6.5	6.5	8.8	7.0	6.5
All sites	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

As pointed out at the beginning of this paper, no case report was obtained during the survey for 217 cancer deaths for which records were obtained from death certificates. These cases were included in the comparison of dead cases with all cases given in table 12, but were not included in any of the other distributions (by site, age, etc.). These 217 death-certificate cases were found to be similar to all dead cases in age and site distributions. The distribution of all cases would be only slightly affected by the inclusion of these cases, since they represent only a small part (3.6 percent) of the total number of cases.

DURATION OF CASES SINCE FIRST DIAGNOSED AS CANCER

Every cancer case reported in the survey had been seen during the year 1937. But many of the cases had also been seen much earlier and were still, or again, being seen in 1937. One of the items of information collected was the date on which the patient had been first seen with cancer. It is true that this date was the time the reporting physician first saw the case, and it may have been seen earlier by some other physician who had lost the case prior to 1937 and so made no

report of his diagnosis. Thus the durations of the cases according to the reported dates first seen may somewhat understate the duration. However, in determining duration, the report of the physician is the only test that can be used.

The length of time from the date first seen, as reported on the schedule, to January 1, 1938, was considered to be the duration for all cases that were reported as alive on that date. For dead cases the period was measured to the month of death, while for cases with unknown vital status, a date midway between the date the case was last seen and January 1, 1938, was used. Table 13 lists separately by color and vital status the percentage distribution of all cases by months since first seen.

TABLE 13.—*Percentages of cases of cancer by months since first diagnosis, by color and vital status, Wayne County, Mich., 1937*

Months since first seen	Percent of cases in each duration group							
	All cases	All white	All colored	Alive		Dead		Vital status unknown[1]
				White	Colored	White	Colored	
Under 6	37.7	37.4	44.4	23.8	30.8	56.9	57.4	51.1
6-11	19.7	19.7	20.9	21.0	20.6	16.9	21.3	21.2
12-17	8.7	8.8	7.7	9.5	6.5	8.1	7.4	7.0
18-23	5.8	5.8	4.7	6.8	6.5	5.0	2.8	3.5
24-29	4.0	4.1	2.1	4.2	1.9	3.7	2.8	4.5
30-35	3.1	3.1	3.0	3.9	1.9	1.9	3.7	2.2
36-41	2.9	2.9	2.1	3.6	3.7	2.1	.9	1.9
42-47	2.2	2.1	2.6	2.7	4.7	1.1	.9	2.1
48-53	1.6	1.6	.4	2.0	.9	1.0	-------	1.6
54-59	1.6	1.6	1.7	2.1	.9	.9	1.9	.6
60-65	1.2	1.2	1.7	1.7	3.7	.1	-------	1.4
66-71	1.1	1.1	.9	1.7	1.9	.3	-------	.3
72-77	.8	.8	.4	1.1	-------	.4	.9	.6
78-83	1.2	1.3	.9	2.0	1.9	.2	-------	.2
84-89	1.1	1.1	.4	1.8	.9	.2	-------	.3
90-95	1.3	1.3	1.3	2.2	2.8	.1	-------	-------
96 and over	6.0	6.1	4.7	9.8	10.3	1.0	-------	1.4
All durations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases (known duration)	5,805	5,571	234	3,173	107	1,790	108	627

[1] 19 of these cases were colored; the others were white.

"Duration" is used here to mean the number of months since date of first diagnosis as discussed previously. The duration of 42 percent of the cases was 12 months or more. This means that over 2,400 cases had been under care or treatment for at least 1 year by the end of 1937. Of those cases, over 700 (nearly 14 percent) had a duration of 5 years or over, and 350 (6 percent) had a duration of 8 or more years. However, when the cases are considered by vital status it appears that some of the cases of long duration ended in death during the study year. There were 18 cases with over 95 months' duration listed as dead, and 44 cases that had been first seen at least 6 years prior to date of death in 1937. Of the cases alive at the end of the study year, nearly 10 percent had a duration of 8 years or more, and over half had a duration of at least 1 year.

The cases among white persons tend to have a longer duration than those among colored persons. In the group with a duration of less than 6 months are found 65 percent of the colored cases and only 57 percent of the white cases. Moreover, 22 percent of the white cases had at least 3 years' duration while less than 17 percent of the colored had been diagnosed that long prior to the end of the survey year. These are indications of the relatively late stage at which colored people receive treatment for cancer.

The duration of cases varies greatly with the primary site of the malignant growth. This is, in great part at least, a reflection of the varying fatality among the sites. For example, only 3 percent of malignant growths primary in the brain had a duration of 3 years or more, while over 30 percent of the skin cancers had that duration. The other sites range between these extremes, respiratory system, digestive tract, and bones having relatively short durations, while breast, buccal cavity, and genitourinary have longer durations. Table 14 lists the percentage distribution of the cases in each primary site by their duration in months and (except for three sites) gives the figures separately for cases alive at the end of the study year and for dead cases. The duration of the dead cases is markedly shorter than that of the live ones. However, this separation does not eliminate the effect of the relative fatality of the various sites on the living cases, for in the more fatal sites there will be fewer living survivors in the longer duration groups.

TABLE 14.—*Percentage distribution of cases by months since first seen, primary site, and vital status at end of survey, Wayne County, Mich., 1937*

Primary site	Percentages of cases in each duration (months since first seen) group												Numbers of cases[2]
	Under 6	6-11	12-17	18-23	24-29	30-35	36-41	42-47	48-53	54-59	60 and over	Total	
Buccal cavity:													
Alive	16.4	21.8	10.1	5.5	4.6	2.9	4.2	2.5	2.1	3.4	26.5	100	238
Dead	*37.8*	*24.3*	*21.6*	*1.4*	*2.7*	*1.4*	*1.4*	*1.4*	*2.7*	*2.7*	*2.7*	*100*	*74*
Digestive tract:													
Alive	37.9	22.1	9.1	6.9	3.6	3.2	2.7	2.7	1.1	1.9	8.8	100	475
Dead	*71.7*	*14.7*	*4.9*	*2.4*	*2.3*	*0.8*	*1.0*	*0.4*	*0.3*	*0.6*	*0.9*	*100*	*788*
Respiratory system:													
Alive	44.3	15.7	12.8	8.6	2.9	------	1.4	2.9	2.9	1.4	7.1	100	70
Dead	*65.3*	*19.4*	*4.2*	*7.6*	*1.4*	*0.7*	------	*0.7*	------	------	*0.7*	*100*	*144*
Genitourinary system:													
Alive	21.7	21.0	9.2	7.1	4.3	3.6	4.3	3.2	2.1	2.5	21.0	100	1,100
Dead	*47.4*	*18.9*	*10.3*	*6.1*	*4.6*	*2.9*	*3.1*	*1.3*	*1.3*	*1.3*	*2.9*	*100*	*477*
Breast:													
Alive	17.8	21.3	8.9	6.8	3.4	4.4	2.8	2.9	2.3	1.8	27.6	100	681
Dead	*29.7*	*17.8*	*10.5*	*10.0*	*9.1*	*5.5*	*5.5*	*3.2*	*1.4*	*2.3*	*5.0*	*100*	*219*
Skin[1]	22.5	19.0	10.4	7.0	4.6	5.6	4.9	1.6	2.3	1.6	20.4	100	431
Brain[1]	40.9	19.7	15.1	7.6	7.6	6.1	------	------	------	------	3.0	100	66
Bones[1]	33.7	23.3	7.0	5.8	4.6	2.3	3.5	5.8	1.2	1.2	11.6	100	86
All others:													
Alive	27.5	22.1	9.5	5.0	3.6	3.1	2.7	1.8	1.8	1.3	21.6	100	222
Dead	*62.6*	*14.0*	*9.3*	*4.7*	*2.8*	*0.9*	------	*1.9*	*1.9*	------	*1.9*	*100*	*107*
All sites:													
Alive	24.0	21.0	9.5	6.8	4.1	3.8	3.6	2.8	1.9	2.1	20.4	100	3,280
Dead	*57.0*	*17.2*	*8.1*	*4.8*	*3.7*	*2.0*	*2.1*	*1.0*	*0.9*	*0.9*	*2.3*	*100*	*1,898*

[1] Too few cases to give percentage distribution by vital status; percentage here refers to all cases reported, living and dead.
[2] Cases of unknown duration, 18 in all, are excluded.

The durations listed here are affected by the less complete reporting of cases of cancer under observation only. As a result the average duration of all cases is somewhat shorter than it would be if all cases under observation, which have a longer than average duration, had been reported.

CASES UNDER OBSERVATION ONLY IN 1937

It will be recalled that the cases of cancer discussed here include all cases of malignant growth that were seen by a doctor or hospital during the study year. Both cases actually under treatment during 1937, and cases that were seen by the doctor during that year but were not treated are included. This last group of cases represents, in a sense, "cured" cases of cancer. Following successful earlier treatment, they had been observed in 1937 and no sign of recurrence of the malignant neoplasm had been discovered. Tables 15 to 19 are concerned with these cases which were under observation only.

Of the total number of cases reported, 1,197, or 20.5 percent, were under observation only in 1937. The percentage of such cases for females, 23, is higher than that for males, 16, and the figure is slightly higher for white than for colored persons. Examination of the cases under observation only, on the basis of the reporting source, shows that 26.8 percent of the total hospital cases were under observation only, while 16 percent of the total cases reported only by doctors were in this category.

TABLE 15.—*Percentages that cases under observation only are of all cancer cases reported, by sex, color, and reporting source, Wayne County, Mich., 1937*

Class of cases	Percentage of all cases in each class					Percentage reported by:		
	Total	Male	Female	White	Colored	Doctor(s) only	Hospital(s) only	Doctor and hospital
Cases under observation only	20.5	16.1	23.3	20.6	19.2	16.1	26.8	21.7
Cases treated in 1937	79.5	83.9	76.7	79.4	80.8	83.9	73.2	78.3
All cases	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 16 shows the percentage distribution of the 1,197 cases under observation only, by the number of months since the case had been last treated. This period was calculated from the date the case was reported as last seen to January 1, 1937. Thus every case listed here, if still alive on January 1, 1938, actually had one year longer duration than the tabulated period, as well as another year without treatment since, had any treatment been received in 1937, the case would have been excluded from this group. More exactly, the duration of each of these observed cases after cessation of treatment averages one year and one half month more than the number of months since last

treatment as recorded in the tables. Cases last treated in December 1936 were listed as zero months since last treated (whereas on the average there would have been one-half month duration), cases last treated in November 1936 were listed as 1 month, etc. Table 16 shows that about 10 percent of the cases under observation only were in the group with a duration of at least 96 months since last treatment. That is, 10 percent, 118 cases, had been under observation for at least 8 years prior to January 1, 1937, and continued under observation with no recurrence of cancer during 1937.

TABLE 16.—*Percentage distribution by months since last treated, for cancer cases under observation only, by sex and reporting source, Wayne County, Mich., 1937*

Months since last treated	Percentage distribution				
	Total cases under observation	Male	Female	Reporting source	
				Doctors only	Hospitals only
Under 6	15.8	20.2	13.9	20.8	14.1
6-11	10.4	13.4	9.2	13.1	9.7
12-17	7.2	9.0	6.4	7.3	7.0
18-23	7.5	7.3	7.6	4.6	8.3
24-29	6.1	4.8	6.7	5.0	6.5
30-35	3.9	4.2	3.8	1.5	4.7
36-41	3.2	3.9	2.9	3.8	3.0
42-47	2.6	3.4	2.3	1.9	2.8
48-53	3.1	3.4	3.0	1.9	3.5
54-59	3.2	2.8	3.3	1.5	3.7
60-65	2.6	1.7	3.0	1.2	2.8
66-71	4.5	5.6	4.0	1.2	5.5
72-77	3.6	2.8	3.9	0.8	4.5
78-83	3.8	1.7	4.6	...	4.7
84-89	3.1	2.0	3.6	...	4.0
90-95	1.8	0.8	2.1	...	2.3
96 and over	9.9	4.5	12.1	1.5	12.3
Unknown	7.7	8.5	7.5	33.8	0.6
Total	100.0	100.0	100.0	100.0	100.0

The same relative relationships between male and female cases and hospital-reported and doctor-reported cases as were seen in table 15 prevail in table 16. Just as a larger percentage of the female than of the male cases were in the group under observation, so a larger percentage of the female cases under observation are in the groups showing a longer duration since last treated. Twelve percent of these female cases (the "cured" cases) had a duration after cessation of treatment of at least 8 years prior to January 1, 1937; the figure for male cases is 4.5 percent. The corresponding figures by reporting source are 12.3 percent for hospitals only and 1.5 percent for doctors only.

An examination of the age distribution of cases under observation only shows very little difference from treated cases. Table 17 gives the percentage distributions by age for treated cases and for observed cases. There is no significant difference in distribution.

TABLE 17.—*Percentage age distributions of cancer cases under observation only during the study year, and of cases treated, Wayne County, Mich., 1937*

Age group	Percent of cases in each age group		Age group	Percent of cases in each age group	
	Cases under observation only	Treated cases		Cases under observation only	Treated cases
Under 15	0 9	0.7	65-74	17.9	18.4
15-24	1 0	1.0	75 and over	7.2	8.7
25-34	3.9	4.6	All known ages	100.0	100.0
35-44	17.3	14.7	Number of cases	1,165	4,530
45-54	28.5	26 4			
55-64	23.3	25 4			

There are marked differences between the distribution by primary site of the cases under observation only and the treated cases, as shown in table 18. Cancer of the digestive tract makes up 27 percent of all cases treated, and only 11 percent of the cases under observation; the respiratory system is the primary site of 5 percent of the treated cases, and of only 1.3 percent of the "cured" cases. Skin, breast, buccal cavity, and genitourinary, however, all are more important sites among the cases under observation than they are of the total number of cases treated.

TABLE 18.—*Percentage site distributions of cancer cases under observation only during the study year and cases treated, Wayne County, Mich., 1937*

Primary site	Percentage in each site group		Primary site	Percentage in each site group	
	Cases under observation only	Treated cases		Cases under observation only	Treated cases
Buccal cavity	8 7	5 5	Brain	1.1	1.2
Digestive tract	10 7	27.4	Bones	1.2	1.7
Respiratory system	1 3	4 9	All others	6.7	6.3
Genitourinary system	35.5	29 1	All sites	100.0	100.0
Breast	21 9	16.7			
Skin	12.9	7.2			

Table 19, listing the percentage distribution of each site by years since last treated (up to January 1, 1937), shows the same variation among the sites. For sites which predominate in the group under observation only, buccal cavity, breast, skin, and genitourinary, there is a larger percentage of cases with longer durations since treatment. Only 3 percent of the observed cases that were primary in the digestive tract had been in the "cured" category for at least 8 years, while 15.4 percent of the observed cases primary in the buccal cavity and 14.5 percent of the breast cases had had that long a duration subsequent to treatment.

Table 19.—*Percentage distribution of the cases under observation only in each primary site group by number of years since last treated, Wayne County, Mich., 1937*

Years since last treated	Percentage distribution						
	Buccal cavity	Digestive tract	Genito-urinary	Breast	Skin	All other sites [1]	All sites combined
Under 1	24.0	29.7	23.8	21.8	32.9	34.1	26.2
1-2	12.5	14.1	13.9	14.1	20.6	13.8	14.7
2-3	11.5	7.8	10.1	10.3	10.3	9.8	10.0
3-4	11.5	4.7	5.9	4.2	5.2	5.7	5.8
4-5	9.6	2.3	5.4	5.3	7.7	10.6	6.3
5-6	7.7	7.0	8.2	8.0	2.6	6.5	7.1
6-7	2.9	5.5	10.4	8.0	3.9	5.7	7.4
7-8	1.0	1.6	5.4	7.6	4.5	4.1	4.8
8 years and over	15.4	3.1	9.4	14.5	9.7	4.1	9.9
Unknown	3.8	24.2	7.5	6.1	2.6	5.7	7.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] There were too few cases in the respiratory system, brain, and bones for separate listing, and these cases are here included in "all other sites."

CANCER CASES ORIGINATING IN 1937

The problem of incidence concerns the number of persons "coming down with" a disease in a set period of time. In computing an incidence rate, only cases of cancer that originated (or were first diagnosed) during the year should be considered. These cases have been tabulated separately but in the absence of recent population figures no rates have been computed. The ratios of resident cancer cases to resident cancer death certificates can be computed for cases originating in 1937 just as was done for all cases. These ratios are 1.7, 1.6, and 1.8 to 1 for total, male, and female cases, respectively. Using the ratio for total cases in conjunction with the 1930 death rate from cancer for Detroit, a rough approximation of the incidence rate may be arrived at. In 1930 there were 73.9 deaths from cancer per 100,000 persons in Detroit. If that rate obtained throughout the survey year, 1937, since there were 1.7 new cases in 1937 for every death, there would have been at least 126 new cases of cancer per 100,000 population. Inasmuch as the cancer death rate is increasing almost everywhere, this would seem to be a conservative approximation of the incidence rate.

TABLE 20.—*Number of cancer cases first seen in 1937, by sex, color, vital status, and residence, Wayne County, Mich.*

Vital status (As of Jan. 1, 1938)	Number of cases first seen in 1937							
	Total		White				Colored[1]	
			Resident		Nonresident			
	Male	Female	Male	Female	Male	Female	Male	Female
Alive	562	914	486	798	58	79	18	37
Dead	587	521	528	452	32	28	27	41
Death certificate located	*509*	*446*	*468*	*394*	*14*	*13*	*27*	*39*
Death certificate not located	*78*	*75*	*60*	*58*	*18*	*15*		*2*
Unknown	146	273	124	227	20	37	2	9
Total reported	1,295	1,708	1,138	1,477	110	144	47	87
Cases from death certificate only	97	120	91	115			6	5
Total death certificates of residents			762	861			39	64

[1] All the colored cases were residents except one female, vital status unknown.

The cancer cases originating in 1937 are listed by sex, color, residence, age, and primary site in appendix tables 21 and 22. From these data tables 21 and 22 have been constructed, showing the percentage distributions of these cases by sex, age, and primary site. In general the distributions are very similar to those for all cases. There are two differences between the distribution of the cases first seen in 1937 and all cases reported. There are, in the former, relatively more cases of cancer primary in the digestive tract and in the respiratory system, and relatively fewer cancers of the skin, breast, and genitourinary system. The other difference is that the cases originating in 1937 have a somewhat lower median age.

TABLE 21.—*Percentage distribution of cancer cases first seen in 1937, by primary site and sex, Wayne County, Mich.*

Primary site	Percent of cases in each site group		Primary site	Percent of cases in each site group	
	Male	Female		Male	Female
Buccal cavity	9.1	1.3	Brain	2.1	0.8
Digestive tract	42.9	23.7	Bones	2.2	1.0
Respiratory	10.4	1.5	All other sites	7.3	6.7
Genitourinary	17.4	34.7			
Breast		25.1	All sites	100.0	100.0
Skin	8.6	5.2			

TABLE 22.—*Percentage distribution of cancer cases first seen in 1937, by age and sex, Wayne County, Mich.*

Age group	Percent of cases in each age group		Age group	Percent of cases in each age group	
	Male	Female		Male	Female
Under 15	1.3	0.4	55-64	27.4	23.3
15-24	1.3	.9	65-74	23.0	14.8
25-34	3.2	6.4	75 and over	10.2	7.7
35-44	10.2	18.7			
45-54	23.4	27.8	All known ages	100.0	100.0

In appendix tables 23 and 24 the actual numbers of cases originating in 1937 are listed for males and for females by primary site and age of patient. The age distribution for any specific site is not significantly different from the similar distribution of all cases reported for that same site. The difference that arises in the age distribution of all cases combined, therefore, comes from the different proportions in which the several primary sites are represented among cases first seen in 1937.

SUMMARY

This paper continues the analysis of a sampling survey of cancer incidence in the United States. The fourth area surveyed, Detroit and Wayne County, Michigan, yielded a total of 6,050 cases of cancer for the calendar year 1937. Doctors and hospitals reported having treated or observed 5,833 of these cases; the remaining 217 were obtained from death certificates only. The total number of death certificates listing cancer as a cause of death in this area in 1937 was 1,764. The ratio of resident cases to resident deaths was 3.2 to 1. This is slightly higher than the ratios for Pittsburgh (2.9 to 1) and Chicago (2.6 to 1) but considerably lower than that for Atlanta (5.3 to 1). On the basis of the 1930 cancer death rate for Detroit, this ratio would represent a prevalence rate of at least 236 cases of cancer per 100,000 population.

Since the error in the reporting was on the side of underreporting, the number of cases reported here definitely establishes a minimum prevalence. The actual prevalence is thought to be slightly greater than here indicated.

About 20 percent of the cases were reported by more than one source. This duplication was carefully eliminated by use of identifying information collected with the case report and the final figures represent unduplicated cases. There were considerably more cases seen by one source only in the Detroit area than in the cities previously surveyed. The extent of duplication varied directly with the accessibility of the primary site involved.

Hospitals alone reported 58.8 percent of all the cases reported; doctors alone reported 27.7 percent; and the remaining 13.5 percent were reported by both doctors and hospitals. There was only one report on 80 percent of the cases; 16 percent were reported by two sources; and the remainder were reported by three or more sources.

The bulk of the cancer cases were treated by a relatively small number of physicians and hospitals. The 78 percent of the doctors who reported less than 2 cases of cancer each, contributed only 15 percent of the total number of cases reported by doctors, while 1.4 percent of the doctors—those reporting 10 or more cases—contributed 32 percent of all the cases reported by doctors. This was also true of the hospitals; 47 percent of them, each reporting less than 2 cases, reported only 0.1 percent of all the hospital cases, while 24 percent of the hospitals, each reporting 10 or more cases, contributed 95.8 percent.

A microscopic examination of tissue confirmed the diagnosis of malignant neoplasm in 78 percent of all the cases reported in Detroit. This is definitely higher than in any of the cities previously surveyed. The proportion of cases so confirmed varied directly with the accessibility of the site involved.

Marked differences exist between males and females in the relative frequency of various primary sites of the malignant growth. For males 36 percent of the cases were primary in the digestive tract, 25 percent in the skin or buccal cavity, and 18 percent in the genitourinary system. For females 38 percent of all cases were primary in the genitourinary system, 29 percent in the breast, and 17 percent in the digestive tract.

For cancer cases of all sites combined 2 percent of the 5,833 cases were under 25 years of age, and 27 percent were over 65 years of age. More of the cases among females than among males are concentrated in the ages from 35 to 55 years. This is largely due to the relatively large numbers of cases of genitourinary and breast cancer found among females in those age groups. The primary sites show sharp differences in age distribution. Skin cases are largely found in the older age groups, while cancer primary in the brain or bones is found most often in young persons. Respiratory malignant growths are concentrated in the late-middle section of the life span, the ages 45 to 64 including over 60 percent of all male and 70 percent of all female cases.

There are marked differences in the relative fatality of malignant growths of various primary sites, as is shown by a comparison of the percentage site distributions of all cases and of all deaths. The sites with the lowest fatality are skin and breast, while cancer primary in the digestive tract or the respiratory system shows the greatest fatality.

Duration, the time from the date first seen to the end of 1937 (for live cases) or to date of death (for cases dying in 1937), was found to be 1 year or more for 42 percent of the cases. There were 14 percent of the cases with a duration of 5 or more years, and 6 percent with a duration of 8 years or over. On the other hand, 38 percent of all cases reported had a duration of less than 6 months. For dead cases, 57 percent had less than 6 months' duration. The duration varies sharply among the sites.

Cases collected in the survey were divided into two categories, those actually receiving treatment in 1937, and those that were observed in 1937 for possible recurrence but were not treated. This latter group, the "cured" cases of cancer, made up 20.5 percent of all cases reported. There was a larger percentage of cases in this group included in hospital reports than in doctors' reports. Ten percent of the 1,197 cases under observation had had a duration, after cessation of treatment, of at least 8 years; nearly 30 percent, at least 5 years. Relatively more female than male cases are in the group under observation, and the period of observation without treatment is longer for females than for males. The age distribution of the cases under observation only is similar to that of the treated cases; the site distribution is different in that the sites with relatively high fatality are represented in smaller proportion in the observed cases.

There were 3,003 cases of cancer originating in 1937. Of these cases 1,295 were male, and 1,708 were females; 2,748 were resident, and 255 were nonresident; 2,869 were white, and 134 were colored. The ratio of resident cancer cases originating during 1937 to all resident deaths is 1.7 to 1. The similar ratios for male and female cases are 1.6 and 1.8, respectively. On the basis of the 1930 cancer death rate, this represents an incidence rate of at least 126 per 100,000 population.

The cases originating in 1937 differ somewhat in distribution from all cases reported. There are relatively more of them in the sites with higher fatality and the median age is lower than for all cases reported.

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(*2*) Dorn, Harold F.: The incidence of cancer in Chicago and Cook County, Illinois. Pub. Health Rep., 55: 628 (1940).

(*3*) McDowell, Arthur J.: The incidence of cancer in Pittsburgh and Allegheny County, Pennsylvania. Pub. Health Rep., 55: 1419 (1940).

Appendix

The appendix tables give the actual numbers on which the percentages of many of the tables in the body of the table are based. The tables are numbered to correspond with the related table in the paper.

Table 2.—*Number of cases of cancer reported by various reporting sources, and number of sources, by sex and color, Wayne County, Mich., 1937*

Reported by	Actual number of cases								
	All cases combined	Both sexes		All colors		White		Colored	
		White	Colored	Male	Female	Male	Female	Male	Female
Nature of source									
Doctor(s) only	1,616	1,592	24	570	1,046	565	1,027	5	19
One doctor	*1,536*	*1,514*	*22*	*544*	*992*	*539*	*975*	*5*	*17*
Hospital(s) only	3,432	3,245	187	1,394	2,038	1,338	1,907	56	131
One hospital	*3,160*	*3,000*	*160*	*1,290*	*1,870*	*1,239*	*1,761*	*51*	*109*
Doctor and hospital	785	762	23	259	526	255	507	4	19
All sources	5,833	5,599	234	2,223	3,610	2,158	3,441	65	169
Number of sources									
One source only	4,696	4,514	182	1,834	2,862	1,778	2,736	56	126
Two sources only	925	887	38	316	609	310	577	6	32
Three or more sources	212	198	14	73	139	70	128	3	11
All sources	5,833	5,599	234	2,223	3,610	2,158	3,441	65	169

Table 3.—*Number of reported cases of cancer by primary site and reporting agency, with numbers of unduplicated cases reported, Wayne County, Mich., 1937*

Primary site	All reports		Reports by doctors only		Reports by hospitals only		Reports by doctors and hospitals
	Total	Unduplicated	Total	Unduplicated	Total	Unduplicated	Total
Buccal cavity	357	302	88	82	237	220	32
Digestive tract	1,399	1,150	444	430	773	720	182
Respiratory system	242	195	51	49	151	146	40
Genitourinary system	1,774	1,359	452	423	1,055	936	267
Breast	1,035	781	273	254	572	527	190
Skin	489	447	148	144	319	303	22
Brain	68	64	31	31	34	33	3
Bones	95	79	24	24	61	55	10
All others	374	320	107	100	231	220	36
All sites	5,833	4,697	1,618	1,537	3,433	3,160	782

TABLE 4.—*Number of sources reporting specified numbers of cancer cases, by source reporting, with actual number of cases reported, Wayne County, Mich., 1937*

Number of cases reported by each source	All sources		Doctors		Hospitals	
	Number of sources reporting	Actual number of cases reported by all sources	Number of sources reporting	Actual number of cases reported by all sources	Number of sources reporting	Actual number of cases reported by all sources
No cases	1,171	0	1,135	0	36	0
One case	410	410	404	404	6	6
Two cases	175	350	172	344	3	6
Three cases	82	246	78	234	4	12
Four cases	63	252	61	244	2	8
Five cases	35	175	32	160	3	15
Five, or less, cases	765	1,433	747	1,386	18	47
Six to ten cases	59	442	53	395	6	47
Ten, or less, cases	824	1,875	800	1,781	24	94
Eleven to twenty cases	27	358	19	245	8	113
Over twenty cases	30	5,248	9	578	21	4,670
Any number of cases	881	7,481	828	2,604	53	4,877
Total reporting	2,052	[1] 7,481	1,963	[1] 2,604	89	[1] 4,877

[1] Includes duplicated cases which were counted only once elsewhere.

TABLE 5.—*Number of cancer cases reported, and number with diagnosis microscopically confirmed, by primary site and whether reported by a hospital, Wayne County, Mich., 1937*

Primary site	Number of cases reported					
	By all sources		By doctors only		By a hospital [1]	
	Total	With microscopic	Total	With microscopic	Total	With microscopic
Buccal cavity	357	296	88	55	269	241
Digestive tract	1,399	892	444	222	955	670
Respiratory system	242	155	51	31	191	124
Genitourinary system	1,774	1,516	452	333	1,322	1,183
Breast	1,035	902	273	198	7 2	704
Skin	489	378	148	72	341	306
Brain	68	48	31	19	37	29
Bones	95	73	24	16	71	57
All others	374	261	107	70	267	221
All sites	5,833	4,551	1,618	1,016	4,215	3,535

[1] Both cases reported only by a hospital, and cases reported by a hospital and a doctor are included here.

TABLE 6.—*Number of reported cases of cancer, by sex, color, and primary site, Wayne County, Mich., 1937*

Primary site	Total		White		Colored	
	Male	Female	Male	Female	Male	Female
Buccal cavity, pharynx	290	67	289	64	1	3
Lip	*155*	*10*	*154*	*10*	*1*	----
Tongue	*43*	*9*	*43*	*9*	----	----
Mouth	*21*	*7*	*21*	*7*	----	----
Jaw	*14*	*7*	*14*	*7*	----	----
Pharynx	*12*	*2*	*12*	*2*	----	----
Others	*45*	*32*	*45*	*29*	----	*3*
Digestive tract	796	603	764	580	32	23
Esophagus	*40*	*16*	*38*	*15*	*2*	*1*
Stomach, duodenum	*327*	*156*	*314*	*151*	*13*	*5*
Intestines	*168*	*177*	*164*	*168*	*4*	*9*
Rectum, anus	*164*	*145*	*158*	*140*	*7*	*5*
Liver, biliary passage	*42*	*6[illegible]*	*40*	*64*	*2*	*2*
Pancreas	*41*	*3[illegible]*	*3[illegible]*	*34*	*5*	*1*
Mesentery, peritoneum	*14*	*8*	*14*	*8*	----	----
Respiratory system	195	47	186	46	9	1
Larynx	*45*	*10*	*43*	*10*	*2*	----
Lungs, pleura	*145*	*32*	*139*	*31*	*6*	*1*
Others	*5*	*5*	*4*	*5*	*1*	----
Genitourinary system	391	1,383	382	1,294	9	89
Uterus	----	*1,101*	----	*1,025*	----	*76*
Kidneys	*51*	*24*	*50*	*24*	*1*	----
Bladder	*98*	*56*	*98*	*56*	----	----
Prostate	*194*	----	*187*	----	*7*	----
Others	*48*	*202*	*47*	*189*	*1*	*13*
Breast	3	1,032	3	991	----	41
Skin	272	217	266	212	6	5
Brain	47	21	47	21	----	----
Bones (except jaw)	59	36	54	35	5	1
All others	170	204	167	198	3	6
Total	2,223	3,610	2,158	3,441	65	169

TABLE 7.—*Number of reported cases of cancer, by age, sex, color, and residence, Wayne County, Mich., 1937*

Age group	Total				Residents				Nonresidents[1]	
	All cases		White only		White		Colored			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Under 5	4	2	4	2	4	1	----	----	----	1
5-9	13	3	13	3	9	2	----	----	4	1
10-14	11	7	10	6	10	6	1	1	----	----
15-19	13	8	13	8	13	8	----	----	----	----
20-24	15	22	14	7	14	14	1	5	----	3
25-29	27	51	27	46	26	41	----	5	1	5
30-34	45	132	40	122	34	115	5	9	6	8
35-39	71	261	63	237	57	225	8	24	6	12
40-44	152	385	147	353	127	327	5	32	20	26
45-49	222	541	215	515	196	476	7	26	19	39
50-54	286	473	280	454	262	416	6	19	18	38
55-59	291	461	281	446	261	409	10	15	20	37
60-64	299	379	296	366	268	332	3	13	28	34
65-69	280	313	271	310	251	276	9	3	20	34
70-74	230	218	225	211	213	192	5	7	12	19
75-79	135	157	134	152	120	141	1	5	14	11
80-84	64	80	63	80	58	75	1	----	5	5
85-89	19	15	17	14	14	13	2	1	3	1
90-94	6	3	6	3	6	2	----	----	----	1
95 and over	----	1	----	1	----	1	----	----	----	----
Unknown	40	98	39	95	38	87	1	3	1	8
Total	2,223	3,610	2,158	3,441	1,981	3,159	65	168	177	283

[1] All white except one case, a colored female aged 30-34, included here.

TABLE 8.—*Number of cancer cases reported, by primary site and age, males only, Wayne County, Mich., 1937*

	Number of cases in each age group									Total
	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	Unknown	
Buccal cavity			11	21	70	93	54	36	5	290
Lip			*7*	*8*	*42*	*41*	*34*	*19*	*4*	*155*
Others			*4*	*13*	*28*	*52*	*20*	*17*	*1*	*135*
Digestive tract	1	6	19	89	179	232	187	67	16	796
Stomach		*1*	*3*	*37*	*75*	*100*	*80*	*25*	*6*	*327*
Intestines		*1*		*23*	*33*	*43*	*45*	*18*	*5*	*168*
Rectum		*2*	*8*	*15*	*50*	*46*	*28*	*12*	*3*	*164*
Others	*1*	*2*	*8*	*14*	*21*	*43*	*34*	*12*	*2*	*137*
Respiratory system		4	4	24	62	54	34	11	2	195
Lungs		*4*	*4*	*20*	*49*	*41*	*19*	*6*	*2*	*145*
Others				*4*	*13*	*13*	*15*	*5*		*50*
Genitourinary system	5	2	12	23	68	95	122	59	5	391
Prostate				*7*	*18*	*42*	*87*	*37*	*3*	*194*
Others	*5*	*2*	*12*	*16*	*50*	*53*	*35*	*22*	*2*	*197*
Breast					1		2			3
Skin	4	1	3	25	60	61	70	42	6	272
Brain	10	1	8	10	10	5	1		2	47
Bones	3	10	7	8	14	6	9	1	1	59
All others	5	4	8	23	43	45	31	8	3	170
All sites	28	28	72	223	507	591	510	224	40	2,223

TABLE 9.—*Number of cancer cases reported, by primary site and age, females only, Wayne County, Mich., 1937*

Primary site	Number of cases in each age group									Total
	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	Unknown	
Buccal cavity	1	2	5	12	12	11	13	8	3	67
Lip	*1*		*2*		*2*	*1*	*2*	*2*		*10*
Others		*2*	*3*	*12*	*10*	*10*	*11*	*6*	*3*	*57*
Digestive tract		3	23	68	136	155	120	79	19	603
Stomach		*1*	*5*	*13*	*28*	*47*	*33*	*26*	*3*	*156*
Intestines		*1*	*10*	*31*	*40*	*38*	*29*	*24*	*4*	*177*
Rectum		*1*	*8*	*15*	*40*	*36*	*23*	*14*	*8*	*145*
Others				*9*	*28*	*34*	*35*	*15*	*4*	*125*
Respiratory system		2	4	4	19	13	4		1	47
Lungs		*1*	*4*	*3*	*13*	*9*	*1*		*1*	*32*
Others		*1*		*1*	*6*	*4*	*3*			*15*
Genitourinary system	3	6	73	310	420	320	175	53	23	1,383
Uterus		*2*	*51*	*249*	*348*	*268*	*120*	*42*	*21*	*1,101*
Others	*3*	*4*	*22*	*61*	*72*	*52*	*55*	*11*	*2*	*282*
Breast		3	45	182	338	236	139	62	27	1,032
Skin	1	2	7	27	35	47	43	44	11	217
Brain	1		3	5	6	3	1		2	21
Bones		3	4	11	4	11	3			36
All others	6	9	19	27	52	35	35	9	12	204
All sites	12	30	183	646	1,022	831	533	255	98	3,610

Table 12.—*Number of recorded cancer deaths with corresponding number of reported cases, by color, sex, and primary site, Wayne County, Mich., 1937*

Primary site	White				Total			
	Male		Female		Male		Female	
	Deaths[1]	Cases	Deaths[1]	Cases	Deaths	Cases	Deaths	Cases
Buccal cavity, pharynx	44	264	10	40	45	265	10	40
Lip	6	154	2	10	6	157	2	10
Tongue	11	43	2	9	11	43	2	9
Mouth	9	21	1	7	9	21	1	7
Jaw	7	14	3	7	7	14	3	7
Pharynx	4	12	2	2	5	12	2	2
Other buccal	7	20	----	5	7	20	----	5
Digestive tract	433	764	347	580	457	796	364	603
Esophagus	29	38	8	15	32	40	10	16
Stomach, duodenum	206	314	118	151	213	327	125	156
Intestines	68	164	89	168	72	168	91	177
Rectum, anus	56	158	47	140	60	164	51	145
Liver, biliary passage	37	40	55	64	38	42	57	66
Pancreas	33	36	24	34	38	41	24	35
Other digestive	4	14	6	8	4	14	6	8
Respiratory system	104	186	24	46	110	195	24	47
Larynx	18	43	2	10	20	45	2	10
Lungs, pleura	65	113	16	26	68	119	16	27
Other	21	30	6	10	22	31	6	10
Genitourinary system	119	382	273	1,290	123	391	306	1,379
Uterus	---	----	202	1,025	----	---	231	1,101
Kidneys	21	50	6	24	21	51	6	24
Bladder	33	98	20	56	33	98	20	56
Prostate	59	187	----	----	63	191	----	----
Other genital	4	29	45	185	4	29	49	198
Other urinary	2	18	----	---	2	19	----	----
Breast	3	3	147	991	4	3	158	1,032
Skin	10	266	2	212	10	272	2	217
Brain	8	47	6	21	8	47	7	21
Bones	12	54	5	35	12	59	5	36
All others	50	192	64	226	53	195	66	235
Total	783	2,158	878	3,441	822	2,223	942	3,610

[1] All cancer death certificates are included here irrespective of whether or not there was a case reported for the death certificate.

Table 13.—*Number of reported cases of cancer by months since first diagnosed, color, and vital status, Wayne County, Mich., 1937*

Months since first diagnosis	Vital status						Total		All cases
	Alive		Dead		Unknown		White	Colored	
	White	Colored	White	Colored	White	Colored			
Under 6	755	33	1,019	62	311	9	2,085	104	2,189
6-11	666	22	302	23	129	4	1,097	49	1,146
12-17	303	7	144	8	41	3	488	18	506
18-23	216	7	80	3	21	1	326	11	337
24-29	132	2	67	3	28	-------	227	5	232
30-35	124	2	34	4	13	1	171	7	178
36-41	113	4	38	1	12	-------	163	5	168
42-47	87	5	19	1	13	-------	119	6	125
48-53	62	1	18	-------	10	-------	90	1	91
54-59	67	1	17	2	3	1	87	4	91
60-65	54	4	2	-------	9	-------	65	4	69
66-71	55	2	5	-------	2	-------	62	2	64
72-77	34	-------	8	1	4	-------	46	1	47
78-83	65	2	4	-------	1	-------	70	2	72
84-89	58	1	4	-------	2	-------	64	1	65
90-95	70	3	2	-------	-------	-------	72	3	75
96 and over	312	11	18	-------	9	-------	339	11	350
Unknown	10	-------	8	-------	10	-------	28	-------	28
Total	3,183	107	1,798	108	618	19	5,599	234	5,833

Table 14.—*Number of reported living cases of cancer, by months since first diagnosis, and primary site, Wayne County, Mich., 1937*

Primary site	Months since first diagnosis									
	Under 6	6–11	12–17	18–23	24–29	30–35	36–41	42–47	48–53	54–59
Buccal cavity, pharynx	39	52	24	13	11	7	10	6	5	8
Lip	15	24	13	9	7	5	8	5	3	5
Tongue	11	7	3	1		2			1	1
Mouth	4	7		1	1					
Jaw	3	3					1			
Pharynx	1							1		
Others	5	11	8	2	3		1		1	2
Digestive tract	180	105	43	33	17	15	13	13	5	9
Esophagus	5	2								
Stomach, duodenum	62	27	8	7	5	4	1	3		2
Intestines	47	30	19	14	1	4	6	3	1	3
Rectum, anus	43	40	14	12	11	6	5	6	4	3
Liver, biliary passage	12	2	1				1	1		1
Pancreas	6	3	1			1				
Mesentery, peritoneum	5	1								
Respiratory system	31	11	9	6	2		1	2	2	1
Larynx	7	1	3	5			1		1	1
Lungs, pleura	23	10	5	1				2		
Others	1		1		2				1	
Genitourinary system	239	231	101	78	47	40	47	35	23	27
Uterus	126	151	67	56	30	29	34	27	16	17
Kidneys	10	15	3	2	3					
Bladder	29	11	11	8	2	5	4	2	2	2
Prostate	40	19	10	6	4		3	1	3	3
Others	34	35	10	6	8	6	6	5	2	5
Breast	121	145	61	46	23	30	19	20	16	12
Skin	87	75	41	28	18	22	20	7	7	7
Brain	12	7	6	3	5	4				
Bones	18	13	4	5	3	1	1	5	1	1
All others	61	49	21	11	8	7	6	4	4	3
Total	788	688	310	223	134	126	117	92	63	68

Primary site	Months since first diagnosis—Continued								
	60–65	66–71	72–77	78–83	84–89	90–95	96+	Unknown	Total
Buccal cavity, pharynx	7	5	2	9	4	4	32	1	239
Lip	3	5		4	4	1	10	1	122
Tongue				2			3		31
Mouth				2			3		18
Jaw	1		1				2		11
Pharynx							1		3
Others	3		1	1		3	13		54
Digestive tract	3	3	2	6	7	7	14	2	477
Esophagus									7
Stomach, duodenum				2	3	4	2	1	131
Intestines	2			1	1	1	6		139
Rectum, anus	1	3	2	3	2	2	5	1	163
Liver, biliary passage							1		19
Pancreas									11
Mesentery, peritoneum					1				7
Respiratory system	1						4		70
Larynx							3		22
Lungs, pleura	1						1		43
Others									5
Genitourinary system	19	19	14	25	18	32	105	4	1,104
Uterus	15	15	11	18	15	24	86	4	741
Kidneys			1						34
Bladder	1	2			1	1	6		87
Prostate				1		1			91
Others	3	2	2	6	2	6	13		151
Breast	13	13	9	15	18	18	102	2	683
Skin	9	10	3	3	8	7	43	1	396
Brain							1		38
Bones		1	1	2		1	4		61
All others	6	6	3	7	4	4	18		222
Total	58	57	34	67	59	73	323	10	3,290

TABLE 15.—*Number of reported dead cases of cancer, by months since first diagnosis, and primary site, Wayne County, Mich., 1937*

Primary site	Months since first diagnosis												
	Under 6	6-11	12-17	18-23	24-29	30-35	36-41	42-47	48-53	54-59	60 and over	Unknown	Total
Buccal cavity, pharynx	28	18	16	1	2	1	1	1	2	2	2	1	75
Lip	5	2	3		1	1			2	1	2		17
Tongue	8	5	5							1			19
Mouth	3	3	1		1			1					9
Jaw	2	3	2				1						8
Pharynx	6	2	1									1	10
Others	4	3	4	1									12
Digestive tract	565	116	39	19	18	6	8	3	2	5	7	4	792
Esophagus	35	7					1				1		44
Stomach, duodenum	228	50	9	4	6	2	3		1	3	1	2	309
Intestines	126	27	10	3	6		2		1	2			177
Rectum, anus	52	23	15	7	5	3	2	3			4	1	115
Liver, biliary passage	68	5	5	4							1	1	84
Pancreas	51	4			1	1							57
Mesentery, peritoneum	5			1									6
Respiratory system	94	28	6	11	2	1		1			1		144
Larynx	11	4	3	4		1					1		24
Lungs, pleura	79	24	3	7	1			1					115
Others	4				1								5
Genitourinary system	226	90	49	29	22	14	15	6	6	6	14	1	478
Uterus	101	46	27	15	14	10	6	4	4	5	9	1	242
Kidneys	20	9	1	2		1	2				2		37
Bladder	34	9	4	1							1		49
Prostate	42	12	8	5	3		6	1	1				78
Others	29	14	9	6	5	3	1	1	1	1	2		72
Breast	65	39	23	22	20	12	12	7	3	5	11		219
Skin	10	7	4	2	2	2	1		3		5		36
Brain	15	6	4	2							1		28
Bones	11	7	2		1	1	2				1	2	25
All others	67	15	10	5	3	1		2	2		2	2	109
All sites combined	1,081	326	153	91	70	38	39	20	18	18	44	8	1,906

TABLE 16.—*Number of cancer cases under observation only during study year, by months since last treated, sex, and color, and by reporting source, Wayne County, Mich., 1937*

Months since last treated	Number of cases under observation only							Number of cases reported by—		
	Total	All		White		Colored		Doctors only	Hospitals only	Doctor and hospital
		Male	Female	Male	Female	Male	Female			
Under 6	189	72	117	69	109	3	8	54	130	5
6-11	125	48	77	47	73	1	4	34	89	2
12-17	86	32	54	32	52		2	19	64	3
18-23	90	26	64	26	62		2	12	76	2
24-29	73	17	56	16	54	1	2	13	60	
30-35	47	15	32	15	30		2	4	43	
36-41	38	14	24	14	24			10	28	
42-47	31	12	19	12	17		2	5	26	
48-53	37	12	25	12	24		1	5	32	
54-59	38	10	28	10	26		2	4	34	
60-65	31	6	25	6	25			3	26	2
66-71	54	20	34	20	32		2	3	51	
72-77	43	10	33	9	31	1	2	2	41	
78-83	45	6	39	6	36		3		43	2
84-89	37	7	30	7	29		1		37	
90-95	21	3	18	3	18				21	
96 and over	118	16	102	16	99		3	4	113	1
Unknown	94	31	63	31	60		3	88	6	
Total	1,197	357	840	351	801	6	39	260	920	17

TABLE 17.—*Number of cancer cases under observation only during the study year, by months since last treated and by age groups, Wayne County, Mich., 1937*

Months since last treated	Age, in years									All ages
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	Unknown	
Under 6	4		8	33	57	49	28	8	2	189
6–11		1	7	28	33	24	18	12	2	125
12–17	1	2	2	17	23	18	19	4		86
18–23		1	2	20	26	20	12	8	1	90
24–29	1	1	2	13	26	16	7	6	1	73
30–35	1	1	2	10	15	9	7	1	1	47
36–41		1	2	2	13	7	9	2	2	38
42–47			1	6	10	4	6	4		31
48–53			3	8	12	9	4	1		37
54–59			2	7	11	9	6	3		38
60–65	2			3	10	12	3	1		31
66–71		2	3	8	13	7	15	6		54
7 –77		1	1	7	11	13	10			43
78–83		1	6	4	9	18	4	3		45
84–89				6	14	6	8	3		37
90–95	1			3	2	5	7	3		21
96 and over		1	2	17	25	35	29	9		118
Unknown			3	9	21	11	17	10	23	91
Total	10	12	46	201	331	272	209	84	32	1,197

TABLE 19.—*Number of cancer cases that were under observation only during the study year, by months since last treated, and primary site with the number of cases treated, Wayne County, Mich., 1937*

Months since last treated	Primary site									All sites combined
	Buccal cavity	Digestive tract	Respiratory	Genito-urinary	Breast	Skin	Brain	Bones	All other sites	
Under 6	19	21	7	57	36	26	8	1	14	189
6–11	6	17	2	44	21	25	2	4	4	125
12–17	6	8	1	29	19	13	2		8	86
18–23	7	10	1	30	18	19	1		4	90
24–29	8	5	2	29	17	9			3	73
30–35	4	5		14	10	7		3	4	47
36–41	6	3		14	8	3		1	3	38
42–47	6	3	1	11	3	5		1	1	31
48–53	5	1		10	8	6			7	37
54–59	5	2		13	6	6			6	38
60–65	3	1		13	10	1		2	1	31
66–71	5	8	1	22	11	3			4	54
72–77	1	5		19	10	2			6	43
78–83	2	2		25	11	4			1	45
84–89	1	1		14	13	4		1	3	37
90–95		1		9	7	3			1	21
96 and over	16	4	1	40	38	15		1	3	118
Unknown	4	31		32	16	4			7	91
Total	104	128	16	425	262	155	13	14	80	1,197
Number treated in 1937	253	1,271	226	1,349	773	334	55	81	294	4,636
Total number of cases	357	1,399	242	1,774	1,035	489	68	95	374	5,833

Table 21.—*Number of cancer cases first seen in 1937, by primary site, sex, color, and residence, Wayne County, Mich., 1937*

Primary site	Number of cases first seen in 1937							
	Total		White				Colored[1]	
			Resident		Nonresident			
	Male	Female	Male	Female	Male	Female	Male	Female
Buccal cavity	118	22	113	22	5			
Digestive tract	556	405	482	359	47	28	27	18
Respiratory	135	25	122	24	6	1	7	
Genitourinary	225	593	197	497	23	56	5	40
Breast		429		373		34		22
Skin	111	89	100	80	9	6	2	3
Brain	27	13	20	10	7	3		
Bones	29	17	23	14	2	3	4	
All other sites	94	115	81	98	11	13	2	4
All sites	1,295	1,708	1,138	1,477	110	144	47	87

[1] All colored cases are resident except one female, primary site genitourinary.

Table 22.—*Number of cancer cases first seen in 1937, by sex, color, age distribution, and residence, Wayne County, Mich.*

Age group	Number of cases first seen in 1937							
	Total		White		Colored[1]		White residents	
	Male	Female	Male	Female	Male	Female	Male	Female
Under 5	3	1	3	1			3	
5-9	6	1	6	1			4	1
10-14	7	5	6	4	1	1	6	4
15-19	7	3	7	3			7	3
20-24	9	12	8	9	1	3	8	8
25-29	12	28	12	25		3	11	22
30-34	29	77	25	69	4	8	20	66
35-39	37	120	30	107	7	13	25	98
40-44	93	188	90	173	3	15	79	159
45-49	130	241	125	233	5	8	112	209
50-54	168	217	164	206	4	11	153	187
55-59	177	197	167	187	8	10	157	172
60-64	173	187	171	184	2	3	153	168
65-69	162	140	154	138	8	2	140	126
70-74	131	105	129	101	2	4	122	89
75-79	86	88	85	85	1	3	77	78
80-84	30	34	30	34			27	33
85-89	10	6	9	5	1		9	4
90-94	4		4				4	
95 and over								
Unknown	21	59	21	56		3	21	50
All ages	1,295	1,708	1,248	1,621	47	87	1,138	1,477

[1] All colored cases are resident except one female, aged 30-34.

Table 23.—*Number of cases first seen in 1937 by primary site and age, males only, Wayne County, Mich.*

Primary site	Number of cases in each age group									All ages
	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	Unknown	
Buccal cavity			8	9	34	27	21	17	2	118
Lip			*5*	*2*	*17*	*8*	*12*	*7*	*1*	*52*
Others			*3*	*7*	*17*	*19*	*9*	*10*	*1*	*66*
Digestive tract	1	4	12	60	120	174	128	52	5	556
Stomach			*2*	*29*	*53*	*80*	*58*	*18*	*1*	*241*
Intestines		*1*		*14*	*24*	*30*	*28*	*15*	*1*	*113*
Rectum		*2*	*4*	*7*	*25*	*29*	*13*	*7*	*2*	*89*
Others	*1*	*1*	*6*	*10*	*18*	*35*	*29*	*12*	*1*	*113*
Respiratory system		3	2	19	47	34	21	7	2	135
Lungs		*3*	*2*	*16*	*38*	*30*	*12*	*5*	*2*	*108*
Others				*3*	*9*	*4*	*9*	*2*		*27*
Genitourinary system	2	1	8	14	41	58	67	20	5	225
Prostate				*5*	*14*	*27*	*51*	*18*	*3*	*118*
Others	*2*	*1*	*8*	*9*	*27*	*31*	*16*	*11*	*2*	*107*
Skin	2		1	11	22	26	29	18	2	111
Brain	6		4	6	3	5	1		2	27
Bones	2	6	3	1	7	3	5	1	1	29
All others	3	2	3	10	24	23	21	6	2	94
All sites	16	16	41	130	298	350	293	130	21	1,295

Table 24.—*Number of cases first seen in 1937, by primary site and age, females only, Wayne County, Mich.*

Primary site	Number of cases in each age group									All ages
	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	Unknown	
Buccal cavity		1	3	3	4	4	2	2	3	22
Digestive tract		2	16	43	85	111	81	54	13	405
Stomach		*1*	*4*	*9*	*23*	*37*	*25*	*20*	*1*	*120*
Intestines		*1*	*7*	*10*	*21*	*28*	*18*	*16*	*1*	*112*
Rectum			*5*	*6*	*20*	*20*	*11*	*5*	*7*	*74*
Others				*8*	*21*	*26*	*27*	*12*	*4*	*99*
Respiratory system			1	3	11	6	3		1	25
Genitourinary system	2	4	36	136	173	124	79	27	12	593
Uterus		*1*	*26*	*108*	*139*	*100*	*43*	*18*	*10*	*445*
Others	*2*	*3*	*10*	*28*	*34*	*24*	*36*	*9*	*2*	*148*
Breast		2	30	89	139	90	49	18	12	429
Skin	1	1	3	12	11	10	14	19	8	89
Brain	1		1	4	2	3			2	13
Bones		1	2	7	1	6				17
All others	3	4	13	11	32	20	17	7	8	115
All sites	7	15	105	308	458	384	245	127	59	1,708

TABLE 25.—*Number of recorded deaths from cancer which were not reported as a case, by sex, color, and primary site, Wayne County, Mich., 1937*

Primary site	Number of deaths			
	White		Total	
	Male	Female	Male	Female
Buccal cavity, pharynx	4		5	
Lip				
Tongue	1		1	
Mouth	1		1	
Jaw	1		2	
Pharynx	1		2	
Other buccal	1		1	
Digestive tract	54	45	59	45
Esophagus	4		5	
Stomach, duodenum	31	17	32	17
Intestines	5	11	6	11
Rectum, anus	3	4	3	4
Liver, biliary passage	5	10	6	10
Pancreas	5	1	6	1
Other digestive	1	2	1	2
Respiratory system	14	1	14	1
Larynx	2		2	
Lungs, pleura	10	1	10	1
Other	2		2	
Genitourinary system	7	38	7	42
Uterus		25		29
Kidneys		4		4
Bladder	3	2	3	2
Prostate	4		4	
Other genital		7		7
Other urinary				
Breast	1	16	1	16
Skin	1		1	
Brain	1	2	1	3
Bones	1		1	
All others	8	13	8	13
Total	91	115	97	120

TABLE 26.—*Number of recorded deaths from cancer which were not reported as a case, by age, sex, and color, Wayne County, Mich., 1937*

Age group	Total		White		Colored	
	Male	Female	Male	Female	Male	Female
Under 5						
5-9	1	1	1	1		
10-14	1		1			
15-19	1	1	1			1
20-24						
25-29	2	1	2	1		
30-34	2	2		2	2	
35-39	2	4	2	3		1
40-44	4	8	3	8	1	
45-49	7	17	6	17	1	
50-54	7	17	7	16		1
55-59	12	16	12	14		2
60-64	20	10	20	10		
65-69	11	13	10	13	1	
70-74	14	14	13	14	1	
75-79	8	7	8	7		
80-84	4	7	4	7		
85-89						
90-94	1	1	1	1		
95 and over						
Unknown		1		1		
All ages	97	120	91	115	6	5

DR. C. S. HUDSON GIVEN BORDEN COMPANY AWARD

At the annual meeting of the American Chemical Society, to be held in St. Louis from April 7 to 11, the annual Borden Co. Award for research on chemistry of milk is to be presented to Dr. C. S. Hudson, Chief of the Chemistry Division of the National Institute of Health. Dr. Hudson, who is known for his contributions in the field of sugar chemistry, will deliver an address on "Milk Sugar" on April 10.

COURT DECISION ON PUBLIC HEALTH

Regulation of city board of health regarding issuance of permits to independent milk distributors upheld.—(New York Court of Appeals; *In the Matter of the Application of John Stracquadanio;* decided March 6, 1941.) The board of health of New York City, in the performance of its statutory duty to protect and promote public health within the city, was authorized to promulgate regulations as a means to accomplish that end and, by appropriate sanitary code provisions, to exercise control and supervision over the delivery of milk and milk products to consumers. Under the sanitary code three classes of permits for the distribution of milk were issued, as follows: Class A, to dealers operating pasteurizing plants in the city; class B, to dealers operating milk depots; and class C, to dealers operating not more than one vehicle in the delivery of milk or milk products and not maintaining a pasteurizing plant or milk depot but utilizing the facilities of such a plant or depot located in the city and operated under a board of health permit. On July 27, 1939, the board of health, under charter authority, promulgated the following regulation defining the conditions under which a class C permit could be issued: "The applicant must be a person of good character, of sufficient experience in the milk industry, and have been a bona fide independent individual milk distributor in this city prior to June 1, 1939."

The petitioner sought a class C permit to deliver milk as an independent distributor but such a permit was denied him by the board of health. Concededly he was not an independent milk distributor prior to June 1, 1939. A proceeding was then instituted by the petitioner to secure a mandatory order directing the board of health to issue to him the desired permit. He asserted that the involved regulation contravened the equal protection clauses of the Federal and State Constitutions and that refusal by the board to issue a permit was capricious, arbitrary, and in violation of the said constitutional provisions. The New York Court of Appeals, however, did not agree with the petitioner's contention and affirmed the denial by the lower courts of the petitioner's application for a mandatory order. The

challenged regulation was deemed by the court to be a valid exercise of the board of health's authority because bearing a reasonable relation to a bona fide purpose by the board to safeguard the milk supply of the city as an incident to the protection and promotion of public health.

DEATHS DURING WEEK ENDED MARCH 22, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar 22, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,041	8,994
Average for 3 prior years	9,062	
Total deaths, first 12 weeks of year	114,896	114,002
Deaths under 1 year of age	536	461
Average for 3 prior years	523	
Deaths under 1 year of age, first 12 weeks of year	6,550	6,198
Data from industrial insurance companies:		
Policies in force	64,591,526	65,940,665
Number of death claims	13,208	12,988
Death claims per 1,000 policies in force, annual rate	10.7	10.3
Death claims per 1,000 policies, first 12 weeks of year, annual rate	10.8	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 29, 1941

Summary

With the single exception of poliomyelitis, increased incidence was recorded for the current week for each of the 9 communicable diseases reported weekly by the State health officers and included in the following table.

Measles, with 55,795 cases reported as compared with 47,421 for the preceding week, still dominates the picture so far as these diseases are concerned. For the second week the number of cases exceeds the peak week of 1938 (44,191 for the week of March 26). An increase was shown for all geographic areas except the West North Central, West South Central, and Pacific States. The highest incidence rates are still reported from the East North Central and Middle Atlantic groups, while the Pacific States recorded the lowest. The largest numbers of reported cases occurred in New York (8,831), Ohio (7,818), Michigan (5,896), and Pennsylvania (5,659).

Of the other 8 diseases included in the table, only influenza and whooping cough were above the 5-year (1936–40) median expectancy. Ten of 54 cases of meningococcus meningitis were reported in Pennsylvania; and of these, 5 occurred in Luzerne County, where a considerable number of cases were reported last year.

Three cases of Rocky Mountain spotted fever were reported in Oregon and 1 case was reported in Montana. Three cases of tularemia were reported in North Carolina and 1 case each in South Carolina and Kentucky. Of 18 cases of endemic typhus fever, 8 cases occurred in Texas.

The death rate for the current week for 93 major cities in the United States was 12.3 per 1,000 population, as compared with 12.6 for the preceding week and with 12.5 for the 3-year (1938–40) average (88 cities) for the corresponding week. The annual rate for the first 13 weeks of the year is 13.7, the same as for the corresponding period of last year.

Telegraphic morbidity reports from State health officers for the week ended March 29, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Mar. 29, 1941	Mar. 30, 1940		Mar. 29, 1941	Mar. 30, 1940		Mar. 29, 1941	Mar. 30, 1940		Mar. 29, 1941	Mar. 30, 1940	
NEW ENG.												
Maine	1	7	1	1	4	8	41	424	164	0	0	0
New Hampshire	0	0	0	------	------	------	83	144	46	0	0	0
Vermont	0	0	0	------	------	------	27	9	43	0	0	0
Massachusetts	2	2	3	------	------	------	787	359	632	3	1	2
Rhode Island	0	0	0	2	------	------	5	158	120	0	0	1
Connecticut	1	0	2	8	6	7	126	134	134	1	0	1
MID. ATL.												
New York	22	16	24	[1] 28	[1] 15	[1] 22	8,831	560	1,467	4	2	8
New Jersey	11	10	10	15	16	16	3,244	461	461	1	0	1
Pennsylvania	9	25	38	------	------	------	5,659	215	595	10	7	7
E. NO. CEN.												
Ohio	7	3	30	16	97	20	7,818	25	411	2	2	7
Indiana	19	6	10	33	27	55	1,095	10	10	1	3	3
Illinois	34	19	35	94	33	52	4,497	82	82	0	2	2
Michigan [2]	11	3	12	28	3	3	5,896	318	318	1	0	2
Wisconsin	0	0	1	324	202	74	1,447	292	292	0	0	1
W. NO. CEN.												
Minnesota	1	2	3	7	3	2	12	214	214	0	0	0
Iowa	6	2	6	71	9	9	270	341	160	0	0	1
Missouri	3	2	11	9	1	62	146	7	24	0	0	0
North Dakota	5	1	1	------	6	6	1	1	3	0	0	0
South Dakota [*]	0	2	0	1	1	------	3	1	2	0	0	0
Nebraska	5	3	3	------	------	------	3	58	64	0	0	0
Kansas	8	0	4	13	4	8	1,133	580	37	1	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	337	0	15	0	0	0
Maryland [3]	4	2	5	176	41	41	393	4	204	0	1	2
Dist. of Col.	2	3	5	2	3	2	276	0	46	0	1	1
Virginia	14	6	16	441	481	484	2,547	203	217	5	1	1
West Virginia [3]	8	5	9	49	138	138	552	17	18	1	2	4
North Carolina	12	22	16	59	57	57	1,600	145	168	3	1	1
South Carolina [3]	5	3	5	713	455	533	598	3	38	0	1	1
Georgia [3]	2	8	8	201	90	336	692	155	155	1	1	2
Florida [3]	6	8	4	165	13	25	1,337	193	186	3	2	2
E. SO. CEN.												
Kentucky	6	6	8	26	64	64	1,280	71	105	5	2	9
Tennessee	11	2	6	220	153	153	712	66	66	0	3	8
Alabama [3]	4	10	5	883	231	674	829	130	130	4	3	8
Mississippi [3]	3	12	4	------	------	------	------	------	------	2	0	1
W. SO. CEN.												
Arkansas	13	6	6	195	254	254	352	12	15	1	1	1
Louisiana	3	7	11	8	31	31	69	32	90	1	0	1
Oklahoma	2	7	7	201	197	197	44	7	26	1	1	1
Texas [3]	40	26	26	2,598	1,154	1,154	1,250	789	440	1	1	3
MOUNTAIN												
Montana [4]	0	1	1	10	43	26	44	35	22	0	0	0
Idaho	0	2	1	------	------	11	17	39	18	0	0	1
Wyoming	1	1	2	------	------	1	126	37	28	0	0	0
Colorado	10	5	7	48	11	------	363	27	27	0	0	0
New Mexico	3	0	2	------	1	19	342	53	87	0	0	0
Arizona	2	5	2	96	137	137	109	104	104	0	0	0
Utah [2]	1	0	0	18	13	------	31	417	150	0	0	0
Nevada	0	------	------	------	------	------	11	------	------	0	------	------
PACIFIC												
Washington	3	1	1	13	------	------	40	891	293	1	0	0
Oregon [4]	3	9	2	22	28	39	361	620	58	1	1	1
California	12	14	22	253	62	417	359	444	686	0	2	3
Total [*]	315	274	414	7,047	4,087	4,770	55,795	8,887	13,005	54	42	77
13 weeks [*]	3,807	4,942	6,774	569,192	149,029	113,646	325,577	76,869	104,857	624	520	1,161

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 29, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Mar. 29, 1941	Mar. 30, 1940		Mar. 29, 1941	Mar. 30, 1940		Mar. 29, 1941	Mar. 30, 1940		Mar. 29, 1941	Mar. 30, 1940	
NEW ENG.												
Maine	0	0	0	5	15	20	0	0	0	0	0	0
New Hampshire	0	0	0	1	1	7	0	0	0	1	0	0
Vermont	0	0	0	16	9	15	0	0	0	0	2	0
Massachusetts	0	0	0	166	163	287	0	0	0	0	0	0
Rhode Island	0	0	0	7	17	29	0	0	0	0	0	0
Connecticut	0	0	0	71	106	106	0	0	0	0	2	1
MID. ATL.												
New York	0	0	1	640	994	994	0	0	0	10	9	5
New Jersey	1	0	0	346	448	272	0	0	0	1	1	1
Pennsylvania	0	1	1	400	548	548	0	0	0	7	7	7
E. NO. CEN.												
Ohio	0	1	1	297	431	431	2	3	3	1	5	2
Indiana	0	0	0	190	252	241	1	5	10	1	0	1
Illinois	1	1	1	512	857	857	7	3	18	3	3	4
Michigan [2]	0	0	0	396	310	522	0	0	9	0	6	5
Wisconsin	0	0	0	156	145	186	7	3	4	0	0	0
W. NO. CEN.												
Minnesota	0	0	0	63	80	147	3	2	13	0	1	1
Iowa	0	1	0	64	75	209	4	23	34	0	1	0
Missouri	1	0	0	40	29	182	17	2	26	1	2	0
North Dakota	0	0	0	9	5	20	0	3	5	0	3	1
South Dakota*	1	0	0	24	13	14	0	1	7	0	0	0
Nebraska	0	0	0	55	19	44	0	3	8	0	0	0
Kansas	0	0	0	61	63	138	1	0	12	2	0	0
SO. ATL.												
Delaware	0	0	0	11	10	9	0	0	0	0	0	0
Maryland [2]	1	0	0	49	38	58	0	0	0	1	2	2
Dist. of Col	0	0	0	14	16	18	0	0	0	2	0	0
Virginia	1	0	0	76	32	32	0	0	0	3	2	4
West Virginia [2]	0	1	0	42	41	44	0	0	0	3	2	4
North Carolina	2	0	0	32	33	30	1	0	0	2	2	2
South Carolina [3]	0	0	0	8	5	5	0	0	0	1	3	2
Georgia [3]	0	0	0	9	20	14	0	3	1	3	0	2
Florida [3]	2	1	1	6	8	8	0	1	0	8	2	2
E. SO. CEN.												
Kentucky	0	0	0	180	111	63	0	0	0	1	2	3
Tennessee	0	0	0	130	94	52	0	0	1	2	1	2
Alabama [4]	2	0	0	25	18	9	0	1	1	3	3	3
Mississippi [3]	2	1	1	0	7	7	0	0	0	0	2	2
W. SO. CEN.												
Arkansas	0	0	0	7	4	10	0	1	1	5	1	1
Louisiana	0	0	0	5	19	13	1	0	1	2	6	10
Oklahoma	1	0	0	18	11	24	0	3	3	1	0	2
Texas [2]	1	4	3	59	37	75	0	5	5	8	5	6
MOUNTAIN												
Montana [4]	1	1	0	34	29	27	0	0	5	0	3	1
Idaho	1	0	0	7	14	14	0	0	3	0	0	1
Wyoming	0	0	0	20	4	17	0	0	2	0	0	0
Colorado	0	0	0	24	44	44	0	7	7	0	0	0
New Mexico	0	0	0	4	22	22	0	0	0	2	3	0
Arizona	0	1	0	9	14	5	0	0	0	0	0	1
Utah [2]	0	3	0	11	12	23	0	0	0	0	0	0
Nevada	0	-----	-----	0	-----	-----	0	-----	-----	1	-----	-----
PACIFIC												
Washington	0	0	0	12	24	44	1	0	10	0	1	2
Oregon [4]	1	0	0	7	20	36	0	1	12	0	0	1
California	1	3	3	133	149	203	0	2	9	4	4	4
Total*	20	19	19	4,451	5,416	5,767	45	72	328	79	86	121
13 weeks*	352	354	277	47,221	61,523	79,381	605	954	3,982	988	1,002	1,406

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 29, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough, Week ended— Mar. 29, 1941	Whooping cough, Week ended— Mar. 30, 1940
NEW ENG.		
Maine	54	33
New Hampshire	9	10
Vermont	27	34
Massachusetts	207	150
Rhode Island	19	8
Connecticut	67	25
MID. ATL.		
New York	334	319
New Jersey	98	82
Pennsylvania	430	380
E. NO. CEN.		
Ohio	322	223
Indiana	25	41
Illinois	95	118
Michigan [2]	427	120
Wisconsin	101	97
W. NO. CEN.		
Minnesota	90	27
Iowa	49	7
Missouri	42	4
North Dakota	26	27
South Dakota*	10	2
Nebraska	50	9
Kansas	119	17
SO. ATL.		
Delaware	7	16
Maryland [2]	80	174
Dist. of Col.	6	7
Virginia	90	32
West Virginia [2]	64	69
North Carolina	307	69
SO. ATL.—continued		
South Carolina [3]	159	15
Georgia [3]	27	28
Florida [3]	18	20
E. SO. CEN.		
Kentucky	82	50
Tennessee	78	36
Alabama [3]	83	33
Mississippi [3]		
W. SO. CEN.		
Arkansas	17	18
Louisiana	12	25
Oklahoma	81	3
Texas [3]	269	243
MOUNTAIN		
Montana [4]	9	1
Idaho	5	25
Wyoming	0	5
Colorado	94	5
New Mexico	31	31
Arizona	40	29
Utah [2]	90	105
Nevada	0	
PACIFIC		
Washington	79	38
Oregon [4]	9	24
California	564	258
Total*	4,911	3,092
13 weeks*	55,910	37,830

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Mar. 29, 1941, 18 cases as follows: South Carolina, 1; Georgia, 2; Florida, 3; Alabama, 3; Mississippi, 1; Texas, 8.
[4] Rocky Mountain spotted fever, week ended Mar. 29, 1941, 4 cases as follows: Montana, 1; Oregon, 3.
*Current report for South Dakota not received; figures included are those reported for the week ended March 22.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 15, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	127	691	122	5, 960	857	2, 200	28	393	22	1, 170	-------
Current week [1]	61	454	63	18, 570	465	1, 379	4	368	30	1, 154	-------
Maine:											
Portland	0	-----	0	1	1	1	0	0	0	10	21
New Hampshire:											
Concord	0	-----	0	0	0	0	0	1	1	0	11
Manchester	0	-----	0	0	2	9	0	0	0	0	19
Nashua	0	-----	0	0	0	0	0	0	0	2	10
Vermont:											
Barre	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Burlington	0	-----	0	0	0	0	0	0	0	0	11
Rutland	0	-----	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	1	-----	1	329	16	24	0	8	0	82	228
Fall River	0	-----	0	0	2	7	0	1	0	1	30
Springfield	0	-----	0	4	2	9	0	3	0	11	38
Worcester	0	-----	0	82	7	9	0	1	0	8	58
Rhode Island:											
Pawtucket	0	-----	0	0	0	1	0	0	0	0	-------
Providence	0	-----	0	2	1	2	0	1	0	16	49
Connecticut:											
Bridgeport	0	1	0	2	4	5	0	1	0	5	41
Hartford	0	-----	0	1	0	2	0	1	0	1	37
New Haven	0	-----	0	1	1	19	0	0	0	7	47
New York:											
Buffalo	0	1	0	83	2	36	0	8	0	12	151
New York	12	54	4	6, 063	88	265	0	84	3	96	1, 563
Rochester	0	-----	0	38	2	3	0	0	1	14	65
Syracuse	0	-----	0	1	2	2	0	1	0	10	41
New Jersey:											
Camden	0	-----	0	24	2	12	0	0	0	6	35
Newark	0	14	1	350	6	61	0	5	0	13	115
Trenton	0	1	0	44	1	51	0	4	0	0	43
Pennsylvania:											
Philadelphia	5	10	6	1, 903	37	85	0	19	1	55	513
Pittsburgh	2	-----	3	216	8	7	0	10	2	44	182
Reading	0	-----	0	280	1	3	0	2	0	6	34
Scranton	0	-----	-----	3	-----	1	0	-----	0	0	-------
Ohio:											
Cincinnati	2	3	1	244	1	16	0	6	0	5	125
Cleveland	0	22	2	2, 975	10	30	0	1	0	75	189
Columbus	0	-----	0	92	2	14	0	2	0	21	90
Toledo	0	5	1	33	3	2	0	3	0	14	70
Indiana:											
Anderson	1	-----	0	1	1	1	0	0	0	0	7
Fort Wayne	0	-----	0	47	1	0	0	1	0	0	26
Indianapolis	3	-----	3	141	5	17	0	7	0	2	104
Muncie	0	-----	0	9	2	15	0	0	0	0	9
South Bend	0	-----	-----	8	-----	3	0	-----	0	0	15
Terre Haute	0	1	1	5	3	0	0	0	0	0	32
Illinois:											
Alton	0	-----	0	0	1	0	0	1	0	0	6
Chicago	9	6	2	2, 293	36	192	0	46	0	31	745
Elgin	0	-----	0	282	1	0	0	0	0	0	8
Moline	0	-----	0	7	0	1	0	0	0	5	16
Springfield	0	8	1	3	3	7	0	0	0	4	22
Michigan:											
Detroit	5	7	2	1, 174	19	134	0	23	0	149	307
Flint	0	-----	1	112	3	2	0	0	0	14	24
Grand Rapids	0	-----	0	315	2	4	0	0	0	14	32
Wisconsin:											
Kenosha	0	-----	0	76	1	2	0	0	0	1	9
Madison	0	-----	0	19	0	2	0	0	0	2	5
Milwaukee	0	7	1	90	8	37	0	0	0	41	116
Racine	0	-----	0	6	0	2	0	0	0	0	20
Superior	0	-----	0	0	0	1	0	0	0	1	7

[1] Figures for Barre, Tampa, Little Rock, and Salt Lake City estimated; reports not received.

City reports for week ended March 15, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0	------	0	0	0	1	0	1	0	11	25
Minneapolis	0	------	3	4	2	14	0	2	0	47	112
St. Paul	0	1	1	3	3	5	0	1	0	6	57
Iowa.											
Cedar Rapids	0	------	------	1	------	1	0	------	0	0	------
Davenport	0	------	------	1	------	5	0	------	0	0	------
Des Moines	1	------	------	1	------	9	0	------	0	0	31
Sioux City	0	------	------	0	------	1	0	------	0	2	------
Waterloo	0	------	------	2	------	0	0	------	0	2	------
Missouri:											
Kansas City	1	------	2	19	8	12	3	3	1	34	118
St Joseph	1	------	0	4	4	1	0	1	0	1	37
St Louis	1	4	1	141	9	75	0	7	0	33	231
North Dakota.											
Fargo	0	------	0	0	1	1	0	0	0	3	10
Grand Forks	0	------	------	0	------	0	0	------	0	1	------
Minot	1	------	------	0	------	0	0	------	0	2	5
South Dakota											
Aberdeen	0	------	------	0	------	1	0	------	0	6	------
Sioux Falls	0	------	------	0	------	1	0	------	0	0	11
Nebraska											
Omaha	0	------	0	0	5	6	0	0	1	1	53
Kansas											
Lawrence	0	2	0	27	0	1	0	0	0	2	9
Topeka	0	------	0	111	1	2	0	0	0	7	16
Wichita	0	------	0	4	2	2	0	0	0	9	26
Delaware:											
Wilmington	0	------	0	166	3	2	0	0	0	0	33
Maryland											
Baltimore	1	10	3	47	21	23	0	9	1	59	234
Cumberland	0	------	0	0	0	0	0	0	0	4	10
Frederick	0	------	------	0	------	0	0	------	0	0	2
District of Columbia:											
Washington	5	5	1	126	16	32	0	10	0	9	173
Virginia											
Lynchburg	1	------	0	10	0	0	0	1	0	0	12
Norfolk	0	42	0	73	2	3	0	1	0	7	50
Richmond	0	------	1	41	6	0	0	1	0	0	50
Roanoke	1	------	0	209	1	2	0	0	0	2	27
West Virginia:											
Charleston	0	------	------	39	------	0	0	------	0	0	------
Huntington	1	------	0	7	------	0	0	------	0	0	------
Wheeling	0	------	0	0	1	0	0	0	0	2	24
North Carolina:											
Gastonia	0	1	------	13	------	0	0	------	0	5	------
Raleigh	0	------	1	159	3	0	0	1	0	15	24
Wilmington	0	------	0	9	0	0	0	0	0	6	8
Winston-Salem	0	7	0	5	2	4	0	1	0	9	20
South Carolina:											
Charleston	0	46	0	16	2	0	0	0	8	4	34
Florence	0	------	0	0	3	0	0	0	0	0	9
Greenville	0	------	0	48	0	0	0	0	0	14	6
Georgia:											
Atlanta	0	7	2	22	3	4	0	4	0	2	96
Brunswick	0	------	0	18	1	0	0	1	0	2	4
Savannah	0	27	2	8	1	1	0	5	0	0	34
Florida:											
Miami	0	6	1	9	2	0	0	2	1	6	36
Tampa	------	------	------	------	------	------	------	------	------	------	------
Kentucky:											
Ashland	0	------	0	1	3	0	0	0	0	0	21
Covington	0	------	0	39	0	1	0	0	0	0	12
Lexington	0	------	0	4	0	3	0	0	0	3	18
Tennessee:											
Knoxville	1	------	0	39	0	12	0	0	0	6	18
Memphis	0	3	2	96	2	7	0	7	0	3	87
Nashville	0	------	0	40	5	15	0	2	1	10	63
Alabama:											
Birmingham	1	4	1	86	3	6	0	5	4	13	54
Mobile	0	10	2	7	1	0	0	1	0	0	33
Montgomery	1	2	------	18	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	5	------	1	0	------	0	0	------
Little Rock	------	------	------	------	------	------	------	------	------	------	------

City reports for week ended March 15, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	1	0	0	4
New Orleans	3	3	1	14	15	3	0	8	1	1	144
Shreveport	0	------	0	0	1	5	0	2	0	0	31
Oklahoma											
Oklahoma City	0	------	0	0	5	8	0	0	1	0	43
Tulsa	0	------	0	1	1	0	0	1	0	12	22
Texas.											
Dallas	0	2	0	4	4	12	0	4	0	1	64
Fort Worth	0	------	0	115	1	5	0	2	0	0	29
Galveston	0	------	0	4	2	0	0	0	0	0	19
Houston	0	------	2	0	10	1	0	8	1	0	102
San Antonio	1	7	4	0	12	4	0	5	0	5	87
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	3
Great Falls	0	------	1	0	1	0	0	0	0	1	9
Helena	0	------	0	0	1	0	0	0	0	0	4
Missoula	0	------	0	0	1	1	0	0	0	0	8
Idaho:											
Boise	0	------	0	0	2	0	1	0	0	0	12
Colorado:											
Colorado Springs	0	------	0	0	0	3	0	0	0	4	13
Denver	3	19	1	93	5	7	0	2	0	32	84
Pueblo	0	------	0	4	1	2	0	0	0	5	3
New Mexico:											
Albuquerque	0	1	0	27	0	0	0	1	0	0	11
Utah.											
Salt Lake City	------	------	------	------	------	------	------	------	------	------	------
Washington:											
Seattle	0	------	0	3	2	2	0	2	0	11	82
Spokane	0	------	0	11	1	2	0	0	0	0	31
Tacoma	0	------	0	0	2	0	0	0	0	5	27
Oregon:											
Portland	0	3	0	15	3	2	0	1	0	0	86
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	3	27	1	24	6	45	0	20	2	40	394
Sacramento	0	------	0	4	0	7	0	2	1	10	44
San Francisco	0	136	0	6	9	6	0	13	0	37	205

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts.				Georgia:			
Boston	1	0	0	Atlanta	1	1	0
New York				Florida:			
New York	3	0	0	Miami	0	0	2
Pennsylvania.				Alabama:			
Pittsburgh	0	1	0	Birmingham	1	0	0
Illinois				Oklahoma:			
Chicago	2	0	0	Oklahoma City	0	0	1
Iowa:				Texas:			
Des Moines	1	0	0	Houston	0	1	0
Maryland.				Washington:			
Baltimore	1	1	0	Seattle	1	0	0
District of Columbia:				California:			
Washington	1	1	0	Sacramento	0	0	1
Virginia:							
Norfolk	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: Huntington, 1 Deaths: New York 2; Memphis 1.
Pellagra.—Cases: Philadelphia, 2, Charleston, S. C., 2; Savannah, 1.
Typhus fever.—Cases: Savannah, 1; Miami, 1; Mobile, 1; Fort Worth, 1. Deaths: Houston, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 22, 1941.—During the week ended February 22, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		9	2	17	17	2		5	6	58
Chickenpox		7		152	210	31	33	23	66	522
Diphtheria		23		26		7	1	1	1	59
Dysentery				12						12
Influenza		52			26	4			59	141
Lethargic encephalitis					1			2		3
Measles	4	335	193	283	907	176	382	454	827	3,561
Mumps				193	213	33	27	27	28	521
Pneumonia	2	15			15	2	1	13	14	62
Scarlet fever		24	3	113	178	5	18	28	7	376
Tuberculosis	2	15	11	60	47	1	5	2		143
Typhoid and paratyphoid fever		1		14						15
Whooping cough		2		178	152	2	46	15	16	411

CUBA

Provinces—Notifiable diseases—4 weeks ended February 1, 1941.—During the 4 weeks ended February 1, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer		4	3	12		13	32
Diphtheria	8	27	1	7	1	4	43
Hookworm disease		62					62
Leprosy					1	3	4
Malaria	47	2		17	3	231	300
Measles		1	1	1			3
Scarlet fever		4			1		5
Tuberculosis	10	10	20	39	12	46	137
Typhoid fever	30	59	12	28	15	19	163
Undulant fever		1					1
Whooping cough		5				3	8

[1] Includes the city of Habana.

SWITZERLAND

Notifiable diseases—November 1940.—During the month of November 1940, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	20	Paratyphoid fever	2
Chickenpox	179	Poliomyelitis	28
Diphtheria and croup	99	Scarlet fever	384
German measles	4	Tuberculosis	244
Influenza	86	Typhoid fever	4
Lethargic encephalitis	2	Undulant fever	10
Measles	257	Whooping cough	209
Mumps	76		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of March 28, 1941, pages 674–678. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Typhus Fever

Tunisia.—According to information dated March 13, 1941, a total of 1,500 to 2,000 cases of typhus fever had been reported in Tunisia. The disease was said to be spreading rapidly in the southern part of the country.

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Public Health Reports

VOLUME 56 APRIL 11, 1941 NUMBER 15

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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CONTENTS

Public Health Reports

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

February 23–March 22, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended March 22, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Measles.—All sections of the country showed a continued increase of measles during the current period. For the country as a whole the cases rose from approximately 73,000 cases for the preceding 4-week period to approximately 156,000 cases for the 4 weeks ended March 22. The number of cases is more than 5 times that reported for the corresponding period in 1940 and more than three and one-half times the 1936–40 median figure for this period. The incidence is the highest since the epidemic of 1937–38 when approximately 173,000 cases were recorded for this period.

A comparison of geographic regions shows that the greatest excesses over the normal seasonal incidence were reported from the Middle Atlantic, East North Central, South Atlantic, and East South Central regions. A minor excess was reported from the West South Central region, and in the New England, Mountain, and Pacific regions the incidence was considerably below the normal expectancy.

Whooping cough.—The incidence of whooping cough was also relatively high. For the current period there were 17,791 cases reported, an excess of about 40 percent over 1940 and more than 10 percent over the 1938–40 average incidence for this period. The Middle Atlantic region alone reported a decline from the average incidence of preceding years; all other regions reported excesses ranging from 10 percent in the South Atlantic region to more than 3 times the average incidence in the West North Central region.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period February 23–March 22, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,110	1,273	1,776	32,019	33,101	41,476	158,391	30,322	44,183
New England	9	26	37	159	48	155	3,890	4,041	6,313
Middle Atlantic	180	176	374	584	245	319	55,408	3,164	13,320
East North Central	211	199	354	1,940	2,797	1,506	56,218	2,671	5,135
West North Central	76	141	149	1,393	518	1,301	4,320	4,500	4,500
South Atlantic	205	256	291	11,085	11,834	11,970	19,509	2,037	5,469
East South Central	74	105	147	3,421	2,777	10,184	6,829	1,255	1,255
West South Central	209	192	276	10,377	12,158	12,109	4,502	2,964	2,768
Mountain	76	71	76	1,257	1,185	1,185	2,491	2,725	2,725
Pacific	70	107	141	1,803	1,539	1,539	3,224	6,965	6,965
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	195	172	329	64	74	78	16,284	20,341	25,538
New England	12	12	12	1	1	1	935	978	1,891
Middle Atlantic	34	42	57	2	8	8	4,726	7,013	7,013
East North Central	25	33	40	5	19	13	5,362	7,254	8,020
West North Central	12	4	31	8	2	4	1,450	1,441	3,711
South Atlantic	43	33	58	15	7	10	999	1,031	1,031
East South Central	32	19	73	10	7	9	1,249	768	634
West South Central	18	15	27	10	12	11	429	357	587
Mountain	6	7	17	4	5	4	432	541	826
Pacific	13	7	15	9	13	11	702	958	1,294
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	183	309	1,290	337	299	423	17,791	12,645	[3] 16,456
New England	0	0	0	12	11	11	1,465	1,153	1,297
Middle Atlantic	0	0	0	44	41	48	3,230	3,241	3,632
East North Central	58	54	199	37	47	67	3,555	2,237	2,587
West North Central	77	89	597	14	26	26	1,548	452	489
South Atlantic	2	10	10	68	47	51	2,912	1,961	2,661
East South Central	8	8	8	51	34	31	645	434	434
West South Central	13	98	98	47	47	93	1,434	907	907
Mountain	7	35	100	37	19	19	926	1,043	795
Pacific	18	15	193	27	27	26	2,076	1,217	1,217

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three-year (1938–40) median.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The incidence of diphtheria continued at a relatively low level. For the 4 weeks ended March 22 there were 1,110 cases reported, approximately 90 percent of the number reported for the corresponding period in 1940 and less than 65 percent of the 1936–40 median figure for the period.

Influenza.—The number of cases of influenza dropped from approximately 146,000 cases for the 4 weeks ended February 22 to approximately 32,000 for the current 4-week period. The number of cases was slightly lower than that recorded for this period in 1940 and only about 75 percent of the median incidence for the years 1936–40. The incidence was considerably below the normal seasonal

expectancy in the South Central regions, and while all other regions showed increases over the 1936–40 median, in some regions the excesses were very slight.

Mortality from all causes for 88 cities reporting dropped from a rate of 13.6 per 1,000 for the preceding 4-week period to 12.7 for the 4 weeks ended March 22; this rate was slightly below the average rate (12.9) for the years 1938–40.

Meningococcus meningitis.—For the current period there were 195 cases of meningococcus meningitis reported, as compared with 172, 201, and 329 for the corresponding period in 1940, 1939, and 1938, respectively. Increases over last year were reported from the West North Central, South Atlantic, South Central, and Pacific regions, but in each region except the New England the current incidence was lower than the 1936–40 median incidence for this period.

Poliomyelitis.—The incidence of poliomyelitis was also relatively low; 64 cases were reported during the 4-week period, as compared with 74 cases for the corresponding period in 1940, and a median of 78 cases for the years 1936–40. A few more cases than might normally be expected were reported from the West North Central and South Atlantic regions, but in all other regions the situation was quite favorable.

Scarlet fever.—The number of cases (16,284) of scarlet fever was only about 80 percent of last year's figure for the corresponding period and less than 65 percent of the expected seasonal incidence. In the East South Central region the number of cases was almost twice the average incidence in that region, but in all other regions the incidence was relatively low.

Smallpox.—The incidence of smallpox reached a new low level for this period. The number of reported cases (183) was only about 60 percent of last year's figure for the corresponding period, which figure (309 cases) was the lowest preceding incidence for the period. A comparison with the 1936–40 median of 1,290 cases and a 1933–36 (more "normal" smallpox years) median of 700 cases further emphasizes the current low incidence of this disease.

Typhoid fever.—For the current period there were 337 cases of typhoid fever reported as compared with 299, 515, and 452 cases for the corresponding period in 1940, 1939, and 1938, respectively. While the number of cases was slightly higher than that recorded for this period in 1940, it was only about 80 percent of the preceding 5-year median figure (423 cases). The disease was somewhat above the seasonal expectancy in the East South Central, South Atlantic, and Mountain regions, about normal in the North Atlantic and Pacific regions, and relatively low in the North Central and West South Central regions.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended March 22, based on data received from the Bureau of the Census, was 12.7 per 1,000 inhabitants (annual basis). The rate was slightly lower than the average rate for the years 1938–40, which was 12.9. The decline in the death rate from 13.6 for the preceding 4-week period to the current rate was no doubt due in part, at least, to the rapid decline in influenza cases that occurred during the 4 weeks under consideration.

MOBILE LABORATORY UNITS OF THE OHIO RIVER POLLUTION SURVEY

By F. E. DeMartini, *Passed Assistant Sanitary Engineer, United States Public Health Service*

In undertaking laboratory operations connected with stream pollution surveys of large or widely separated watershed areas, the use of a central laboratory may be impracticable because of its inaccessibility to the more distant sampling points. Under these circumstances it is necessary to consider either the equipment and maintenance of several fixed laboratories, entailing a multiplied expense, or the use of mobile laboratories which can be moved over the entire area at will. The latter of these alternative procedures has many points in its favor, including greater flexibility and economy.

In 1939 a problem of this kind was faced by engineers of the Public Health Service in undertaking a comprehensive laboratory survey of the sanitary condition of the Ohio River and its tributary streams over an area of some 203,000 square miles. This work is being carried on by the Stream Pollution Investigations Station at Cincinnati, in connection with the Ohio River Pollution Survey, a joint undertaking with the U. S. Engineer Corps under the provisions of the River and Harbor Act of August 1937.

The laboratory study of the tributaries of the Ohio River involved the examination of many large streams several hundred miles in length and in many cases so distant from the base laboratories on the main Ohio River that samples could not be transported to them and still be representative of the stream water.

Three possibilities presented themselves for carrying on the tributary examinations: (1) Subsidizing a considerable number of laboratories throughout the area to carry on the work; (2) training a large personnel and obtaining the cooperation of local laboratories to the extent of providing equipment and working space; (3) using some type of mobile laboratory unit which could be moved from place to place in the area without too much difficulty. It was concluded

that use of mobile laboratories would be the most satisfactory and economical solution to the problem.

Several State health departments have utilized mobile laboratories in recent years. In most cases they were built into bus type vehicles with their own motive power. Such units, if used also for collection of samples, have a limited usefulness owing to the time required for the collections. A better unit seemed to be of the type developed by the Dental Service of the U. S. Public Health Service for use at Coast Guard Stations throughout the country. These units consist of a trailer containing all of the equipment for dental work, and a tow car to move the unit from place to place.

In its application to laboratory examination of stream samples, the laboratory unit or trailer is stationed for a considerable period (2 weeks or more) at a central point. The tow car is used during this period for collection of samples in a radius of about 50 miles, delivering samples to the laboratory unit. The mobile units described were designed on this basis and equipped for making the following tests:

1. Dissolved oxygen.
2. 5-Day biochemical oxygen demand.
3. Temperature.
4. pH.
5. Alkalinity.
6. Soap hardness.
7. Turbidity.
8. Total agar count at 37° C.
9. Coliform index (by dilution method).
10. Nitrites.
11. Acidity.
12. Iron (ferrous and ferric).

Provision of space for the necessary incubators and equipment together with adequate bench space to allow working room for two technicians governed the actual design and layout of the units. It had been decided that a three-man crew would be necessary—one junior chemist, one laboratory attendant, and one sample collector and chauffeur. Various layouts and sizes for the trailer unit were considered; the one shown in figure 4 was finally adopted as the best of those studied. Some of the main points brought out during the design were: (1) The advisability of providing as much working bench space as possible; (2) space and load limitations would not allow provision of equipment for gas heat or electric power generation; (3) a standard type of trailer shell and chassis could be used but the interior benches and furnishing would have to be specially built for the purpose.

Early in 1939 plans and specifications for the mobile unit were prepared, bids were obtained, and the contract was awarded to one of the commercial concerns building house-trailer units.

Figure 1 shows a trailer unit and tow car. The trailer is supported by jacks to steady it against movements as it would be "on location."

Two units were in the field from September 12, 1939, to the end of the year, representing 27 trailer weeks of field service, in an area of

27,000 square miles. Total number of collections was 841, representing 3,364 samples, as 4 samples were taken at each collection.

During 1940 four additional units were obtained, differing only slightly from the first two. The 1940 operations represent 161 trailer weeks of field service in an area of 103,000 square miles. Total number of collections in 1940 was 5,068, which represents 20,272 samples.

In addition one unit made several hundred odor threshold observations in 1939–40 on a special taste and odor problem, during the winter months of December to March inclusive. This study will again be carried on this winter (1940–41) to compare results of last season with present conditions. A second unit is carrying on a similar study in another area where, in addition to odor tests and routine observations, phenol determinations are being made.

With this brief statement of accomplishments as the background upon which our experience with mobile units is based, the following comments seem justified.

In stream pollution surveys or laboratory operations involving a large field of activity, the mobile trailer laboratory has a definite place. The units described here have been successfully used to carry out the problem for which they were designed. There have been no serious difficulties with the units during this survey, but certain improvements would be made in additional units. Briefly, these are:

1. Use of a heavier tow car than the type in use at present.
2. Installation of a heavy-duty clutch and special transmission, having an extra low gear, on the tow car.
3. Limitation of the total weight of trailer unit, exclusive of payload, in order to make vertical load on drawbar a reasonable value, when axle is properly located on chassis.

DETAILED DESCRIPTION OF MOBILE UNITS AND THEIR OPERATIONS

Some of the features provided in these units will be briefly mentioned:

1. Trailer shell of the commercial type with heavy frame, tires, and axle; walls insulated with glass wool and all window glass of the safety type.
2. Work bench 37 inches in height around the entire periphery of the unit except at the door. No space is occupied above bench top level by incubators or fixed equipment.
3. An acid and alkali resistant "karcite" sink and lead lined bench-top around this sink. (A second small porcelain sink is provided at center of side bench.)
4. A 30-gallon water tank supplying double-action pumps at each sink; a second faucet at the karcite sink connected by hose line to a pressure water supply.
5. Small house trailer type of built-in ice box.

6. Ventilating fan in roof vent.

7. Electrical wiring in trailer with ample capacity to supply current for incubators, hot plates, electric muffle, etc., controlled by a load center box. An insulated copper wire cable 150 feet long for transmitting electric current from an outside source to the trailer unit.

8. Auxiliary trailer brakes, and stop and turn signals on trailer, all operated by switches from tow car.

9. Four jacks for leveling trailer floor and to relieve springs from trailer load during a stop at one "location."

10. Fire extinguishers and gasoline stove for laboratory use supplied as part of the trailer contract.

After delivery of the units at Cincinnati, 2 weeks were spent in preparing them for field operations. These preparations were principally:

1. Treatment of bench tops with acid-proof stain.

2. Installation of 20° C. incubator, 37° C. incubator, and hot air sterilizer.

3. Construction of "egg-crate" type boxes and trays for storing bottles and various items of glassware.

4. Preparation of chemical reagents and bacteriological media for beginning of field work.

5. Loading of all equipment and supplies in lockers and cupboards.

It may be of interest to mention that the 37° C. incubator is water jacketed. This is believed to be the best type for field use under varying climatic conditions and heavy loading of the incubator itself. The one selected has proven to be very satisfactory and to hold its temperature uniformly in spite of adverse conditions.

The 20° C. incubator was built to specifications. An electrically operated unit was designed to fit under the working bench. The contractor used a standard refrigerator box with compressor unit located in the bottom section. By cutting off the lower section of the box, and placing the compressor unit in a cupboard adjacent to the incubator, a full-sized incubator was provided which could fit in the space available beneath the bench level.

Figures 2 and 3 are views of the interior of the trailer laboratory.

The first two units started work on September 12, 1939. Arrangements were made in advance with some waterworks or sewage treatment plant in the area to be covered, including a parking space for the trailer unit where water, power, and waste disposal facilities were convenient. Upon arrival the trailer was moved into place, tow car uncoupled, trailer stabilized by means of a jack at each corner so as to level it and steady it against movements, rear sink faucet connected to a water supply by means of a 50-foot garden hose, and the 150-foot cable plugged into the trailer at one end and to a source of electrical energy at the other. Within a few hours incubators attained their

proper temperatures and the unit was ready to operate for any desired period.

Upon moving to a new location the 20° and 37° C. incubators vary from these temperatures depending upon the time involved in the move. However, if this is only a matter of a few hours the variations are not great as the 37° C. incubator has a 2-inch water jacket and the heat differential between the inside and outside of the 20° incubator is low except under extreme weather conditions.

Average duration of work at a given location was 2 weeks, but in some cases stops were as long as 3 months. Local authorities and waterworks officials have been most cooperative and no difficulty has been experienced in obtaining quarters, water, and electric power for the units.

The following tabulation indicates the average volume of work carried on per month by one mobile unit:

Number of samples collected	475
Number of bacteriological tests made	250
Number of physical and chemical tests made	850

Each collection at a station represented four samples—one for bacteriological tests, one for chemical tests, one for dissolved oxygen, and one for 5-day B. O. D. Each determination is considered to be a "test." These tests include dissolved oxygen, 5-day B. O. D., turbidity, pH, alkalinity, acidity, soap hardness, iron, nitrites, *B. coli*, and total agar count.

COSTS OF MOBILE LABORATORY UNITS

Costs have been estimated for obtaining laboratory results in the mobile units as compared with the Kiski (the floating laboratory on the Ohio River) and the Cincinnati laboratory. These estimates are based on a 4-year life for expendible equipment such as glassware, trailer, and tow car, and 8-year life for incubators, furniture, etc. This represents a depreciation of approximately 2 percent and 1 percent, respectively, per month. Salaries, operating costs, travel, clerical, and engineering costs were also included. The comparative costs were found to be:

	Trailer laboratory	*Kiski laboratory*	*Cincinnati laboratory*
Cost per sample	$2. 78	$2. 26	$1. 79
Cost per test	1. 22	1. 13	1. 09

Costs of trailers, tow cars, and equipment are tabulated below. A plan of the trailer units is also shown (fig. 4), as revised in 1940 when the second group of four units was ordered. The revisions consisted of additional interior lights, provision of a ventilation opening for the compressor unit of the 20° C. incubator, extension of the lead-lined portion of the bench, and an increase of 4 inches in ceiling height to 6 feet 6 inches instead of 6 feet 2 inches.

FIGURE 1.—Trailer unit and tow car.

FIGURE 2.—Looking toward rear of trailer unit.

FIGURE 3.—Looking toward front of trailer unit.

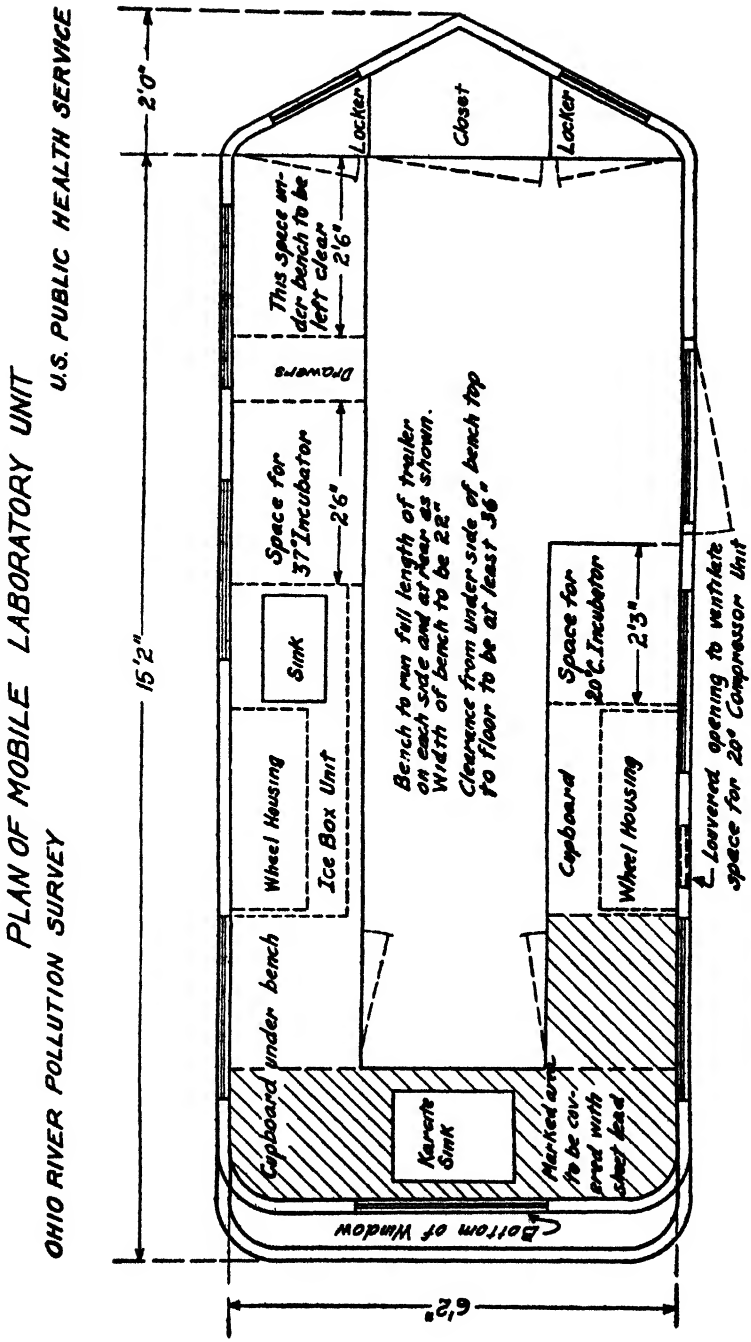

PLAN OF MOBILE LABORATORY UNIT
OHIO RIVER POLLUTION SURVEY
U.S. PUBLIC HEALTH SERVICE
2'0"
15'2"
6'2"
Locker
Closet
Locker
This space under bench to be left clear
2'6"
Drawers
Space for 37" Incubator
2'6"
Sink
Wheel Housing
Ice Box Unit
Cupboard under bench
Kansite Sink
Marked area to be covered with sheet lead
Bench to run full length of trailer on each side and at rear as shown. Width of bench to be 22"
Clearance from underside of bench top to floor to be at least 36"
Space for 20°C. Incubator
2'3"
Cupboard
Wheel Housing
Louvered opening to ventilate space for 20° Compressor Unit
Bottom of Window

FIGURE 4.

Cost figures for mobile field laboratory, tow car, equipment, and 6 months' supplies [1]

Item	*Cost*
A. Trailer	[2] $1,850.00
B. Tow car	649.13
C. Laboratory equipment	711.72
D. Glassware	231.90
E. Sampling equipment	47.00
F. Chemicals and supplies for 6 months	80.00
G. Miscellaneous	45.75
Total	3,615.50

DETAILED COST DATA

Item A.—Trailer unit includes benches, lockers, 2 sinks, water tank and plumbing, 1 spare tire, 150 feet of 60-ampere capacity wire cable, ventilating fan, two 1-quart fire extinguishers, 4 hydraulic jacks, and a 2-burner gasoline stove. Also includes installation of helper springs and tow iron on a coupe tow car		$1,850.00
Item B.—Tow car, standard 85-horsepower coupe		649.13
Item C.—Laboratory equipment:		
1 20° C. incubator (specially built)	$230.00	
1 37° C. water jacketed incubator	173.04	
1 pH kit, Sanitary District Chicago	53.56	
1 Electric hot air sterilizer	45.32	
1 Quebec colony counter	30.90	
1 22-quart pressure cooker	18.22	
1 Chemical balance and set of weights	12.61	
1 Artificial daylight lamp	10.00	
1 Electric heater (1,000 watts)	8.75	
1 8-inch electric hot plate	7.26	
All other equipment such as wire baskets, pots, pipette cans, burette holders, alcohol lamps, etc	122.06	
		711.72
Item D.—Glassware. Includes all bottles, burettes, cylinders, test tubes, flasks, pipettes, funnels, petri dishes, etc		231.90
Item E.—Sampling equipment:		
Sampling can and rope	$32.00	
1 pair rubber hip boots	5.00	
1 sampling kit for shallow streams	10.00	
		47.00
Item F.—Chemicals and supplies. Includes chemical supplies, dehydrated media, alcohol, gasoline for stove, towels, soap, brushes, rubber stoppers, filter paper, etc		80.00
Item G.—Miscellaneous:		
50 feet of garden hose	$5.77	
1 first-aid kit	2.11	
2 laboratory stools	9.89	
1 copy Standard Methods of Water Analysis	2.58	
Lumber for trays, test tube blocks, etc	17.90	
Screen, bolts, nails, etc., for installing equipment	2.00	
Car wax, chamois, sponge, rear-view mirror, etc	5.50	45.75
Total		$3,615.50

[1] Last four trailers cost $1,256.70 each.

[2] Three percent was added to this cost by the Procurement Division, U. S. Treasury Department, for handling contract. Total cost to Ohio River Pollution Survey was $1,905.50 for each of the first two trailers.

DOMESTIC WATER AND DENTAL CARIES

II. A Study of 2,832 White Children, Aged 12–14 Years, of 8 Suburban Chicago Communities, Including *Lactobacillus Acidophilus* Studies of 1,761 Children [1]

By H. TRENDLEY DEAN, *Dental Surgeon*, PHILIP JAY,[2] *Consultant*, FRANCIS A. ARNOLD, JR., *Passed Assistant Dental Surgeon*, and ELIAS ELVOVE, *Senior Chemist, United States Public Health Service*

(Clinical Examinations by Assistant Dental Surgeons (R) David C. Johnston and Edwin M. Short)

Recent studies (*1*, *2*) have disclosed marked differences in the amount of dental caries among communities often in close proximity to one another. Considering the apparent similarity of the population groups, especially those in Galesburg, Monmouth, Macomb, and Quincy (Ill.), and the method followed in the selection of the samples, it is difficult from an epidemiological standpoint to ascribe these differences to any cause other than the mineral composition of the common water supply. At the present time both epidemiological and experimental evidence points to fluoride as the factor partially inhibiting dental caries, but the possibility that other constituents of the water may likewise play some role cannot at present be entirely ruled out on the basis of the epidemiological evidence available.

A marked difference in the amount of dental caries was particularly noticeable in the Galesburg-Quincy study. In the latter city the children, using a public water supply practically free of fluorides (0.2 p. p. m.),[3] had experienced more than three times as much dental caries as had a comparable age group living in the nearby city of Galesburg where the common water supply contains 1.8 p. p. m. of fluorides (F). The continued use of this water, somewhat in excess of the minimal threshold of endemic dental fluorosis (1.0 p. p. m.), was found to be associated not only with a low dental caries rate but also with unusually low oral lactobacilli counts.

A domestic water containing 1.8 p. p. m. of fluorides produces the mildest types of mottled enamel in about 45 to 50 percent of those continuously using it during the period of susceptibility, the remainder showing no macroscopic evidence of the affection. A percentage incidence of affection of this approximate order makes possible a comparison of the amount of dental caries in a group of children having the mildest forms of mottled enamel with a comparable group free of mottled enamel. No significant difference in the amount of dental caries between the two groups was apparent and it appeared that the factor responsible for the low amount of dental caries in that city was

[1] From the Division of Infectious Diseases with the cooperation of the Division of Chemistry, National Institute of Health.

[2] Assistant Professor, University of Michigan School of Dentistry.

[3] This figure was obtained only in one sample; a few recent determinations indicated about 0.1 part per million (p. p. m. = parts per million).

operative irrespective of whether the child showed macroscopic evidence of mottled enamel or not.

It is obvious that whatever effect the waters with relatively high fluoride content (over 2.0 p. p. m. of F) have on dental caries is largely one of academic interest; the resultant permanent disfigurement of many of the users far outweighs any advantage that might accrue from the standpoint of partial control of dental caries. On the other hand, the demonstration of such marked dental caries differences as were observed at Galesburg and Quincy made advisable a quantitative study of the influence on dental caries of waters with lower ranges of fluoride concentration. If marked inhibitory influences were operative at concentration levels as low as the minimal threshold of endemic dental fluorosis (1.0 p. p. m.), the findings would be of considerable import.

PRESENT STUDY

The basic objective of this study was to determine how low a fluoride concentration in a public water supply would be found associated with relatively low dental caries rates. The study closely followed that made at Galesburg and Quincy (*2*) excepting that only children with continuous exposure to the public water supply of their respective communities were examined. All examinations were limited to 12–14-year-old white public school children, age being defined by last birthday. Selection of this segment of the school population permits the examination of a group in whom a high percentage of the permanent teeth have erupted. The results of an examination of school children of higher age groups introduces the question of representativeness of the sample because of the increasing percentage of children in the higher age groups not attending school.

The communities selected for study necessarily had to possess the dual requisites of (*a*) a population sufficient in size to permit the selection of an adequate sample of children continuously exposed to the influence of the variable under investigation, and (*b*) a public water supply of the desired fluorine concentration with no serious interfering relevant variables in either its physical set-up or its source during the period concomitant with the life of the group examined.

The selection of cities meeting these requirements would have been difficult but for the extensive studies carried on in 1936 by the Illinois Department of Public Health. In 1937 Weart and Klassen (*3*) reported on the fluoride content of many Illinois common water supplies, 78 communities being listed as having 0.9 part per million or more of fluoride (F) in their public water supplies. This work proved of value in selecting the areas to be studied.

The disclosure of a number of suburban Chicago communities with small amounts of fluorides in their domestic water supplies presented

the unusual epidemiological opportunity of comparing their dental caries experience rates with those of their neighbors using the fluoride-free Lake Michigan water.

The communities selected for study, the findings of which form the basis of this report, were Elmhurst, Maywood, Aurora, Joliet, Elgin, Evanston, Oak Park, and Waukegan.

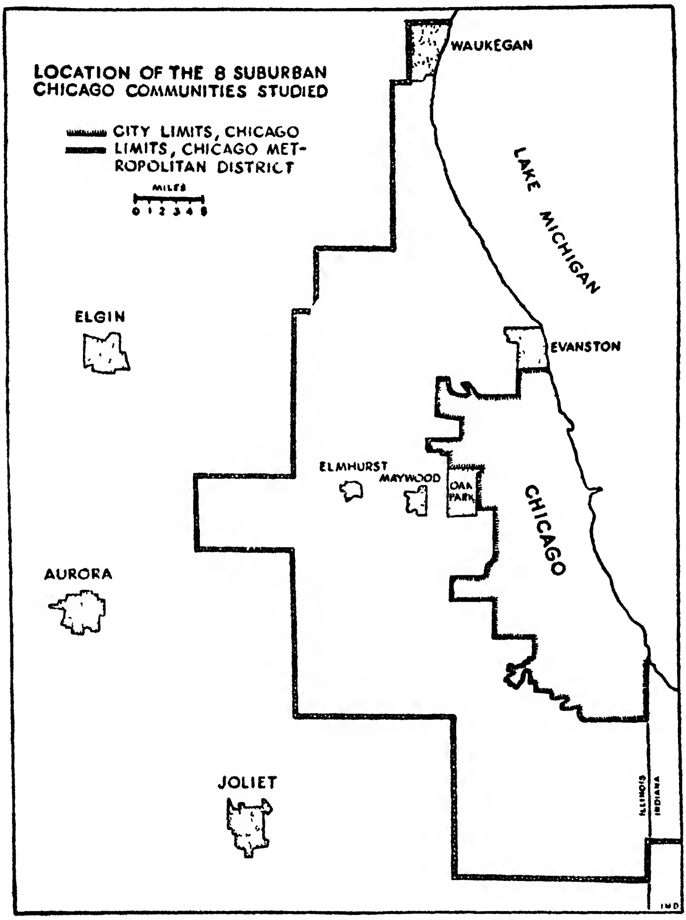


FIGURE 1.—Location of the eight communities studied.

Their location with respect to the city of Chicago and the Chicago Metropolitan District[4] is shown in figure 1.

Population of cities studied.—Population statistics with respect to the eight cities or villages studied are given in table 1. Inasmuch as the study was limited to white school children, the percentage of native white was computed on the basis of the total white population, not the total population. At Elmhurst, Maywood, Aurora, Joliet,

[4] Limits of the Chicago Metropolitan District as shown in the Fifteenth Census of the United States, 1930, Metropolitan Districts, Population and Area.

Elgin, Evanston, Oak Park, and Waukegan the percentage of native white of the white population was 86.4, 84.0, 86.8, 82.8, 84.6, 83.5, 86.8, and 79.7 percent, respectively.

TABLE 1.—*Composition of the population of the 8 suburban Chicago communities studied (census of 1930)*

City	Total	White	Negro	Other races [1]	Total	White	Negro	Other races [1]	Native white of white population
	Number				Percent				
Elmhurst	14, 055	14, 023	13	19	100. 0	99. 77	0. 09	0. 14	86 4
Maywood	25, 829	25, 087	722	20	100. 0	97. 13	2. 79	0. 08	84. 0
Aurora	46, 589	45, 348	936	305	100. 0	97. 34	2. 01	0. 65	86 8
Joliet	42, 993	40, 797	1, 309	887	100. 0	94. 89	3. 05	2. 06	82. 8
Elgin	35, 929	35, 539	310	80	100. 0	98. 92	0. 86	0. 22	84. 6
Evanston	63, 338	58, 338	4, 938	62	100. 0	92. 10	7. 80	0. 10	83. 5
Oak Park	63. 982	63, 798	143	41	100 0	99. 71	0. 22	0 07	86 8
Waukegan	33, 499	31, 925	1, 017	557	100. 0	95. 30	3. 04	1. 66	79. 7

[1] While the Negro was excluded from this study because of the possibility of a racial difference in attack by dental caries, no attempt was made to eliminate children of "other races." This segment of the population was of such a relatively small percentage of the general population (0.6 percent) of the 8 communities studied that it seemed unnecessary to eliminate the occasional child who may have belonged in this classification. They are, accordingly, included with the white children in the tables that follow in this paper. Persons of Mexican birth or parentage who were not definitely reported as white or Indian were designated "Mexican" in the 1930 Census and included in the general class of "other races." In prior censuses most of the Mexicans have been classified as white. Of the 1,952 persons listed in this column, Elmhurst excluded, 1,755, or approximately 90 percent, were Mexicans.

Climatological data.—Weather Bureau reports list the number of clear, partly cloudy, and cloudy days as recorded for a number of stations in northern Illinois. Reporting stations are located at three of the cities included in this study, viz, Aurora, Joliet, and Waukegan. No station is located at Oak Park but it is assumed that the recordings of the Cicero Station probably reflect this type of climatological data

TABLE 2.—*A 5-year summary of available data concerning number of clear, partly cloudy, and cloudy days recorded for cities included in this study, or from communities in their immediate vicinity*

[From Weather Bureau, Department of Agriculture]

Station	Number of days														
	Clear					Partly cloudy					Cloudy				
	1935	1936	1937	1938	1939	1935	1936	1937	1938	1939	1935	1936	1937	1938	1939
Aurora	175	179	182	176	199	54	92	74	53	59	136	95	109	136	107
Chicago (University)	85	101	114	112	132	98	92	109	90	105	182	143	142	163	128
Cicero	81	119	99	100	116	104	96	129	108	110	180	151	137	157	139
Joliet	135	174	159	166	167	75	83	87	74	80	155	109	119	125	118
Waukegan	146	153	164	205	195	122	145	155	75	82	97	68	46	85	88
Average, Northern Division (Illinois)	137	184	168	157	173	89	87	86	93	89	139	95	111	115	103

N. B.: A day is classified clear, partly cloudy, or cloudy, on the basis of hourly estimations, sunrise to sunset, as follows:

Clear .... Sky averages 3/10 or less obscured.
Partly cloudy .... Sky averages 4/10 to 7/10, inclusive, obscured.
Cloudy .... Sky averages more than 7/10 obscured.

for Oak Park inasmuch as the corporate limits of Cicero and Oak Park adjoin. These same conditions might also be considered as probably applicable to Maywood, which is about one and one-half miles west of Oak Park. The number of clear, partly cloudy, and cloudy days was not recorded at the Elgin Station and no stations are listed for Evanston and Elmhurst. Available data on this subject are shown in table 2.

Sampling method.—The group examined was selected in the following manner. The classroom or assembly hall was visited and the purposes of the survey explained to the teacher and the pupils. Those children who stated that they had lived in the city continuously since birth and had always used the common water supply for domestic purposes (drinking and cooking) were assembled in a separate group. This group was then further questioned to determine whether there had been any breaks in the continuity of their residence and water consumption. If questioning elicited information which disclosed breaks in the continuity of exposure (30 days in any calendar year excepted), the child was eliminated from further study. Those remaining constituted the group classified as continuously exposed since birth to the effects of the local water supply. Immediately after the selection of the group to be studied, the name, address, age, grade, continuity of residence, and other pertinent data were recorded on a sampling card, one being made out for each child. Each child was again carefully questioned several days later at the time of the clinical examination regarding his or her water history. This second cross-questioning at times revealed discontinuities in water history not brought out in the first questioning; the number further eliminated by this second questioning was in the neighborhood of 10 percent of the group for whom sampling cards had been made out previously.

All sampling was done by one individual (H. T. D.). With the exception of Evanston and the ninth grades (Freshman High School) at Oak Park, Maywood, Elmhurst, Joliet, Waukegan, and at the West Side High School at Aurora, each classroom or assembly hall was visited and the sampling done at that time. Excepting Aurora all communities included in this study have one large community high school and relatively large enrollments. To meet this particular condition a method of "home room" sampling was developed and carried out by each home room teacher, after instruction in the method to be followed. At Evanston all seventh, eighth, and ninth grade pupils attend one of three large schools. In this city it was necessary to utilize the home room method of sampling through the medium of the home room teacher for the entire group. Each of the three schools has a school physician, and the sampling was supervised by the school physician in collaboration with the one of us (H. T. D.) conducting the sampling aspects of the study.

This method of preliminary sampling by the home room teacher was necessary in 9 of the 67 schools included in the study, and the results obtained were quite satisfactory. All children selected by the home room teacher were subsequently questioned individually by the dental examiner when the water history was recorded prior to the clinical examination.

The samples examined generally represent all white public school children in the community with the requisites of continuity of exposure defined. All public schools in the community having a seventh, eighth, or ninth grade were included in the study, but no effort was made to locate 12–14-year-old children in grades other than those specified, with the exception of those instances where an appreciable number of children of the age group studied were in the sixth grade.

The percentage of continuous histories is unusually low at Evanston, Oak Park, and Maywood. This may be due to (*a*) the common practice of children of these three communities going away for summer vacations considerably in excess of 30 days, and (*b*) to the movement in and out of Chicago or between the highly urbanized communities adjacent to the corporate limits of Chicago.

It might be well to digress for a moment and touch upon certain basic constants and pertinent interfering variables, particularly as they relate to the problem of sampling. As dental caries is a non-healing lesion, a single clinical dental examination of 12–14-year-old children can merely record the amount of dental caries experienced by that group during the post-eruptive life of the teeth examined. The observed lesion may have developed at any time during the post-eruptive life of the tooth examined. At what particular time during the post-eruptive tooth life the observed lesion developed cannot be determined on the basis of a single examination in this age group.

The movement of populations, especially in the densely populated urbanized areas contiguous to the city of Chicago, is quite marked. The water supplies of these numerous communities show considerable variation, some purchasing Lake Michigan water from the city of Chicago, others depending wholly upon the municipal ground water supply. As single clinical examinations in this age group can disclose only the amount of dental caries experienced and not when it occurred, the corollary that naturally follows demands that all observations be confined to children with continuous exposure to the variable under study (the communal water supply). Otherwise, dental caries developed several years previously in an area with a high rate might be erroneously charged to an area with a low rate, or vice versa. In order, therefore, that differences in dental caries experience might be effectively studied with respect to their relationship to the mineral composition of the public water supply, all groups

compared were placed on a comparable basis of exposure to risk, namely, age, sex, color, and continuous use of the water supply being studied.

Table 3 shows the number of public schools in which examinations were held, the number of 12–14-year-old pupils in attendance on the day of sampling, and the number and percentage of these whose histories on repeated questioning indicated continuity of exposure and who were examined. Attention might be called to the difference in the percentages of those with continuous histories between those communities contiguous to the city of Chicago (Evanston, Oak Park, and Maywood) and the more outlying suburbs such as Waukegan, Elgin, Aurora, and Joliet.

TABLE 3.—*Summary of data with relation to continuity of exposure to the public water supply of 2,832 white 12–14-year-old children residing in 8 suburban Chicago communities*

Place	Number of public schools in which examinations were held	Number of 12–14-year-old children in attendance on day of sampling	Number of 12–14-year-old white children whose histories on repeated questioning [1] indicated continuity of exposure and who were examined	Percentage of the total present who were examined
Elmhurst	7	633	170	26.9
Maywood	6	873	171	19.6
Aurora	13	1,625	633	39.0
Joliet	6	1,412	447	31.7
Elgin	10	1,030	403	39.1
Evanston	3	2,125	[2] 256	12.0
Oak Park	12	1,662	329	19.8
Waukegan	10	1,354	423	31.2
Total	67	10,714	2,832	26.4

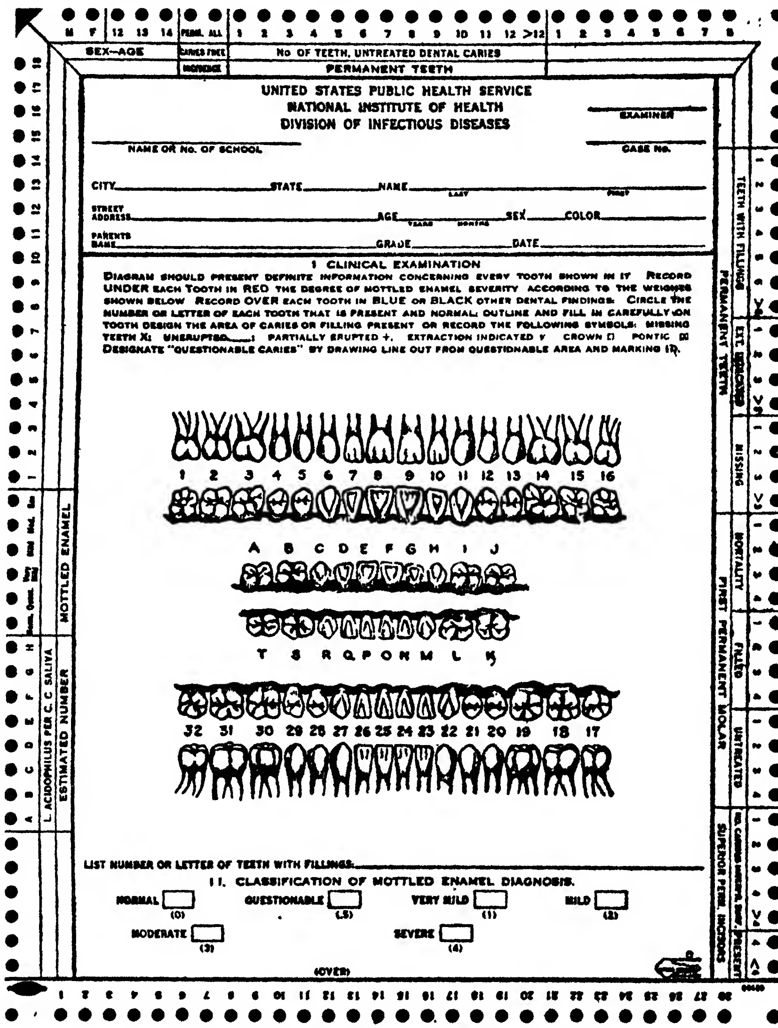
[1] About 20 percent of the group for whom sampling cards were originally made out were not examined. The detailed subsequent questioning which disclosed breaks in the continuity of exposure warranting elimination from the study accounted for about half of the cases excluded and these, together with those absent on the day of examination and the colored, comprised the 20 percent referred to.

[2] In addition there were 53 other children with a history of continuous exposure whose parents did not give their consent to making the clinical examination.

Clinical examinations.—All examinations were made by a dentist using a mouth mirror and explorer with the child seated facing a window. Explorers used throughout the study were double end No. 3. New explorers were provided at intervals throughout the study and Arkansas stones were furnished the examiners in order that the explorer points might be kept sharp at all times. In all instances the instruments used in the examinations were taken from the sterilizer and placed in a common pool from which the examiner selected the instrument to be used. Failure in coalescence of enamel lobes (pits and fissures) in which the end of the explorer caught but which showed no evidence of dental caries was not counted as caries. Pits or fissures showing one or more of the following criteria were counted as caries irrespective of how small the cavitation: Slight opacity around the

edges, underlying dark stain suggestive of caries, or a perceptible soft feeling when the explorer was inserted in the pit or fissure. Examination of each child took approximately 10 minutes.

The personal interpretation in diagnosis is subject to some variation between examiners. This is especially noticeable in communities


SEX—AGE | CARIES FREE | No OF TEETH, UNTREATED DENTAL CARIES

M F 12 13 14 | PERM. ALL | 1 2 3 4 5 6 7 8 9 10 11 12 >12 | 1 2 3 4 5 6 7 8

INCIDENCE | PERMANENT TEETH

UNITED STATES PUBLIC HEALTH SERVICE
NATIONAL INSTITUTE OF HEALTH
DIVISION OF INFECTIOUS DISEASES

EXAMINER

NAME OR No. OF SCHOOL

CASE No.

CITY ______ STATE ______ NAME ______ LAST ______ FIRST

STREET ADDRESS ______ AGE ______ YEARS ______ MONTHS ______ SEX ______ COLOR ______

PARENTS NAME ______ GRADE ______ DATE ______

I CLINICAL EXAMINATION

DIAGRAM SHOULD PRESENT DEFINITE INFORMATION CONCERNING EVERY TOOTH SHOWN IN IT. RECORD UNDER EACH TOOTH IN RED THE DEGREE OF MOTTLED ENAMEL SEVERITY ACCORDING TO THE WEIGHTS SHOWN BELOW. RECORD OVER EACH TOOTH IN BLUE OR BLACK OTHER DENTAL FINDINGS. CIRCLE THE NUMBER OR LETTER OF EACH TOOTH THAT IS PRESENT AND NORMAL; OUTLINE AND FILL IN CAREFULLY ON TOOTH DESIGN THE AREA OF CARIES OR FILLING PRESENT OR RECORD THE FOLLOWING SYMBOLS: MISSING TEETH X; UNERUPTED ___; PARTIALLY ERUPTED +, EXTRACTION INDICATED ∨ CROWN ◻ PONTIC ⊠. DESIGNATE "QUESTIONABLE CARIES" BY DRAWING LINE OUT FROM QUESTIONABLE AREA AND MARKING IT.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

A B C D E F G H I J

T S R Q P O N M L K

32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17

LIST NUMBER OR LETTER OF TEETH WITH FILLINGS ______

II. CLASSIFICATION OF MOTTLED ENAMEL DIAGNOSIS.

NORMAL (0) QUESTIONABLE (.5) VERY MILD (1) MILD (2)

MODERATE (3) SEVERE (4)

(OVER)

MOTTLED ENAMEL

L. ACIDOPHILUS PER C.C. SALIVA

ESTIMATED NUMBER

TEETH WITH FILLINGS

PERMANENT TEETH

EXT. INDICATED

MISSING

MORTALITY

FIRST PERMANENT MOLAR

FILLED

UNTREATED

SUPERIOR PERM. INCISORS

PRESENT

FIGURE 2.—Form used in dental caries study (front).

characterized by low dental caries experience rates where oftentimes pits and fissures introduce an important problem of subjective assessment. The inherent variation associated with subjective assessment results in varying degrees of differences between examiners in dental caries diagnosis. Attempts to equalize variation between the examiners (Assistant Dental Surgeons (R) David C. Johnston and

Edwin M. Short), or at least to make such variations compensatory insofar as group differences in dental caries rates were concerned, were made as follows:

1. With respect to previous training both examiners had completed a year's post-graduate study in children's dentistry at the Forsyth

III. WATER HISTORY ENUMERATOR:__________

RESIDENCE FROM BIRTH IN CHRONOLOGICAL ORDER *	DURATION (YRS)	SOURCE OF DRINKING WATER					
		MUNICIPAL	DEEP WELL	SHALLOW WELL	CISTERN	SPRING	OTHER
BIRTH PLACE							
2.							
3							
4							
5							
6							
7							

*IGNORE CHANGES IN A DURATION OF RESIDENCE LESS THAN THIRTY DAYS IN ONE CALENDAR YEAR

WAS ABOVE HISTORY CONFIRMED BY INTERVIEW WITH CHILD'S PARENTS? YES ☐ NO ☐

BROTHERS AND/OR SISTERS IN SCHOOL NONE ( )
NAME__________ GRADE_____ SCHOOL_____
NAME__________ GRADE_____ SCHOOL_____
NAME__________ GRADE_____ SCHOOL_____

REMARKS:__________

IV. BACTERIOLOGICAL FINDINGS

DATE	ACID AGAR (COLONIES PER C C SALIVA)							ACID BROTH	
	DIL	L. A (S)	L. A (R)	PIN POINT	YEAST	STAPH	STREP.	SALIVA	FECES

FIGURE 2.—Form used in dental caries study (back).

Dental Infirmary, Boston, Mass., about a month prior to the beginning of this study. This one year of specialized training in the same class in a subject pertinent to this study, dental caries in children, should have a tendency to bring the examiners into closer diagnostic accord than if the study had been made by two examiners of dissimilar training.

2. At the beginning of the study, the diagnostic criteria of the two examiners were calibrated for several weeks by one of us (F. A. A., Jr.) in both an area with a high dental caries rate (Waukegan) and in one with a low dental caries rate (Maywood).

3. The examiners worked together as a team, visiting each school included in the study, and each examined approximately an equal number of children in each school. The examination schedules were numbered serially, and throughout the entire study all odd-numbered cases were examined by one examiner, all even-numbered by the other.

The clinical findings [5] were recorded on a schedule form designed for combined dental caries and mottled enamel studies (fig. 2). The several communities were studied in this order: Waukegan, Maywood, Oak Park, Elmhurst, Elgin, Evanston, Aurora, and Joliet, the purpose being to have examiners alternate between areas which, on the basis of the fluoride content of the public water supply, might be expected to show high and low dental caries experience rates.

CLINICAL FINDINGS

In the eight communities studied, 2,832 children were examined; they were distributed according to age and sex as shown in table 4.

TABLE 4.—*Distribution of the 2,832 children examined, according to age and sex*

City	Total	Age in years, last birthday								
		12			13			14		
		M	F	Both sexes	M	F	Both sexes	M	F	Both sexes
	Number									
Elmhurst	170	36	28	64	31	29	60	22	24	46
Maywood	171	34	20	54	31	33	64	27	26	53
Aurora	633	120	88	208	121	104	225	105	95	200
Joliet	447	67	60	127	66	90	156	63	101	164
Elgin	403	72	90	162	52	55	107	75	59	134
Evanston	256	30	52	82	48	54	102	33	39	72
Oak Park	329	55	66	121	49	54	103	54	51	105
Waukegan	423	60	70	130	62	90	152	68	73	141
	Percent									
Elmhurst	100.0	21.2	16.5	37.7	18.2	17.1	35.3	12.9	14.1	27.0
Maywood	100.0	19.9	11.7	31.6	18.1	19.3	37.4	15.8	15.2	31.0
Aurora	100.0	19.0	13.9	32.9	19.1	16.4	35.5	16.6	15.0	31.6
Joliet	100.0	15.0	13.4	28.4	14.8	20.1	34.9	14.1	22.6	36.7
Elgin	100.0	17.9	22.3	40.2	12.9	13.7	26.6	18.6	14.6	33.2
Evanston	100.0	11.7	20.3	32.0	18.8	21.1	39.9	12.9	15.2	28.1
Oak Park	100.0	16.7	20.1	36.8	14.9	16.4	31.3	16.4	15.5	31.9
Waukegan	100.0	14.2	16.6	30.8	14.6	21.3	35.9	16.1	17.2	33.3

[5] The clinical examinations were made during September, October, November, and December 1939.

In table 5 are shown the number of children examined, the number and percentage of children showing dental caries experience (permanent teeth),[6] the number and percentage of children with no dental caries experience (permanent teeth), and the dental caries experience (permanent teeth) by single age groupings. In computing an index for showing the amount of dental caries in these population groups it was decided to express the amount of dental caries in terms of the dental caries experience of the group. Dental caries experience (permanent teeth) is determined by totaling the number of times the following items were recorded on the clinical examination form: Filled teeth (past dental caries), untreated dental caries, extraction indicated, and missing teeth.[7] In computing this index no single tooth is counted more than once even though one surface may show a carious lesion and another surface a filling.[8] When it is desired to express the dental caries experience in terms of a rate per 100 children, the sum of the 4 aggregates referred to is divided by the number of children examined and the quotient multiplied by 100.

TABLE 5.—*Summary of the percentage incidence and dental caries experience, permanent teeth, in selected 12–14-year-old white school children of 8 suburban Chicago communities*

City	Number of children examined	Children with dental caries experience	Children showing no dental caries experience	Dental caries experience, permanent teeth: Age in years, last birthday 12	13	14	Total
		Number					
Elmhurst	170	127	43	138	135	156	429
Maywood	171	120	51	112	154	176	442
Aurora	633	484	149	474	620	684	1,778
Joliet	447	365	82	363	500	580	1,443
Elgin	403	357	46	600	480	709	1,789
Evanston	256	246	10	462	690	571	1,723
Oak Park	329	315	14	705	717	952	2,374
Waukegan	423	410	13	890	1,249	1,288	3,427
		Percent		Number per 100 children			
Elmhurst		74.7	25.3	216	225	339	252
Maywood		70.2	29.8	207	241	332	258
Aurora		76.5	23.5	228	276	342	281
Joliet		81.7	18.3	286	321	354	323
Elgin		88.6	11.4	370	449	529	444
Evanston		96.1	3.9	563	676	793	673
Oak Park		95.7	4.3	583	696	907	722
Waukegan		96.9	3.1	685	822	913	810

[6] All data in the tables to follow refer to permanent teeth only.

[7] In this study third molars are excluded from consideration; the occasional instance of teeth lost by accident or extracted because of malposition is also excluded.

[8] In this study a tooth showing both an untreated lesion and a filling was counted as a "filled tooth."

An analysis of the data in table 5 shows a remarkable difference in the amount of dental caries in these selected groups, both with respect to the percentage incidence of affection and to the dental caries experience. For instance, the combined dental caries experience rate for the 1,421 children of those communities (Elmhurst, Maywood, Aurora, and Joliet) whose public water supplies contain fluorides (F) in excess of 1.0 p. p. m. is 288 per 100 children in contrast to a rate of 746 per 100 children in the 1,008 children of communities (Evanston, Oak Park, and Waukegan) using water with a fluoride content of 0.0 p. p. m.[9] In other words, there is 2.6 times as much dental caries in the latter communities as in the former.

With respect to the data on permanent teeth shown in table 5 it also seems desirable to list how much each of the following items contributed to the rates shown: Filled teeth (past dental caries), untreated dental caries, extraction indicated, and missing teeth (teeth lost because of accident, or extracted because of malposition excluded). These data are shown in table 6 and figure 3.

TABLE 6.—*Summary of the dental caries experience in the permanent teeth of 2,832 white school children, aged 12–14 years, of 8 suburban Chicago communities classified on the basis of filled teeth (past dental caries), untreated dental caries, extraction indicated, and missing teeth (presumably because of dental caries)*

City	Number of children examined	Dental caries experience, permanent teeth				
		Filled teeth (past dental caries) (a)	Untreated dental caries (b)	Extraction indicated (c)	Missing teeth (d)	Total (a+b+c+d)
		(A) Number				
Elmhurst	170	234	173	12	10	429
Maywood	171	216	202	3	21	442
Aurora	633	629	1,055	22	72	1,778
Joliet	447	468	879	18	78	1,443
Elgin	403	781	918	24	66	1,789
Evanston	256	985	614	24	100	1,723
Oak Park	329	1,546	715	18	95	2,374
Waukegan	423	1,527	1,536	70	294	3,427
		(B) Number per 100 children				
Elmhurst	----------	137.6	101.8	7.1	5.9	252
Maywood	----------	126.3	118.1	1.8	12.3	258
Aurora	----------	99.4	166.7	3.5	11.4	281
Joliet	----------	104.7	196.6	4.0	17.4	323
Elgin	----------	193.8	227.8	6.0	16.4	444
Evanston	----------	384.8	239.8	9.4	39.1	673
Oak Park	----------	469.9	217.3	5.5	28.9	722
Waukegan	----------	361.0	363.1	16.5	69.5	810

Proximal dental caries.—An unusual difference in the amount of dental caries in the proximal surfaces of the four superior permanent incisors was noted in the four Illinois cities previously studied (*2*).

[9] The limit of the sensitivity of the procedure used for the fluoride determinations may be considered as about 0.1 part per million.

At Macomb and Quincy there was about 16 times as much of this type of dental caries as was observed in the children of Galesburg and Monmouth.

The dental caries experience of the eight proximal surfaces of the four superior permanent incisors in the children of the eight communities included in this report is shown in table 7.

Differences of approximately the same order of magnitude as previously reported were found in the communities included in this study. For example, in the cities using a fluoride-free water (Evanston, Oak Park, and Waukegan) dental caries experience was evidenced in

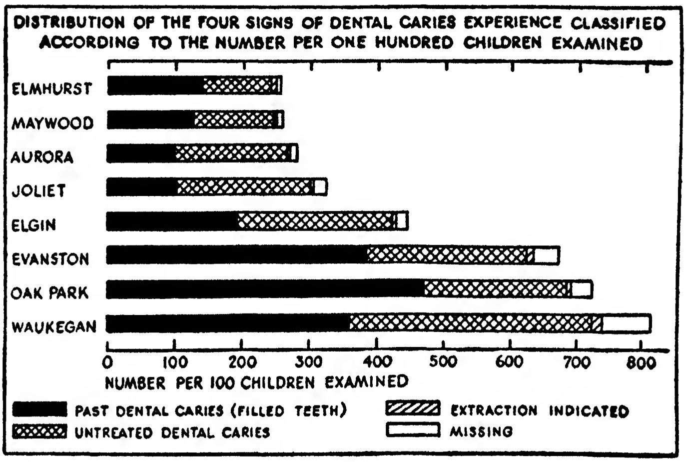


FIGURE 3.

1,043 out of 7,968 surfaces, or a rate of 13.1 per 100 surfaces. In the 11,256 proximal surfaces in the children exposed to waters with a fluoride (F) content in excess of 1.0 p. p. m. (Elmhurst, Maywood, Aurora, and Joliet) evidence of dental caries was discernible in only 103, or a rate of 0.9 per 100 surfaces. Or, to summarize, there was 14.3 times as much of this type of caries in the former group as in the latter group.

TABLE 7.—*Dental caries experience of the proximal surfaces of the four superior permanent incisors of selected children of 8 suburban Chicago communities*

City	Number of children examined	Number of proximal surfaces [1]	Number of proximal surfaces with dental caries experience	Dental caries experience per 100 surfaces
Elmhurst	170	1,342	8	0.60
Maywood	171	1,358	8	.59
Aurora	633	5,000	39	.78
Joliet	447	3,556	48	1.3
Elgin	403	3,170	130	4.1
Evanston	256	2,030	218	10.7
Oak Park	329	2,584	232	9 0
Waukegan	423	3,354	593	17.7

[1] Teeth lost by accident, unerupted, extracted because of malposition, and proximal surfaces restored by prosthesis (inlays, ¾ crowns, etc.) because of traumatic injury, excluded. The maximum possible number of surfaces in a population of this size (2,832) is 22,656. The number of surfaces excluded for the reasons stated was 262, or approximately 1.2 percent.

First permanent molar mortality.—An index of value for measuring certain aspects of the dental caries problem is the first permanent molar mortality rate. Knutson and Klein (*4*) define tooth mortality as referring to "not only extracted permanent teeth but also those which are indicated for extraction and still present in the mouth"; molar mortality rates reported in table 8 were computed in accordance with this definition. In order to determine how closely this index might reflect differences in the dental caries experience of the eight surveyed communities, the first permanent molar mortality rate for each community was computed. Furthermore, as tooth mortality may be influenced by the amount of remedial treatment received, data with respect to the number and percent of filled permanent molars are furnished for a fuller interpretation of the molar mortality rates reported.

TABLE 8.—*Summary of data respecting first permanent molar mortality rates, including number and percent of filled teeth, in selected 12–14-year-old children of 8 suburban Chicago communities*

[All teeth referred to in this table are first permanent molars]

City or village	Elmhurst	Maywood	Aurora	Joliet	Elgin	Evanston	Oak Park	Waukegan
Number of children examined	170	171	633	447	403	256	329	423
Molar population—estimated (number of children examined × 4)	680	684	2,532	1,788	1,612	1,024	1,316	1,692
Percent of children with 1 or more missing teeth (extraction indicated included)	7.6	8.2	10.4	12.8	13.9	23.4	17.9	40.9
Number of teeth showing dental caries experience:								
(a) Filled teeth	197	159	464	339	559	593	883	724
(b) Untreated dental caries	88	99	533	441	428	164	148	372
(c+d) Extraction indicated and missing	20	20	92	87	82	109	102	338
(a+b+c+d) Total	305	278	1,089	867	1,069	866	1,133	1,434
Percent of teeth showing dental caries experience	44.9	40.6	43.0	48.5	66.3	84.6	86.1	84.8
First permanent molar mortality, number per 100 children	11.8	11.7	14.5	19.5	20.3	42.6	31.0	79.9
Percent of dental caries experience with fillings, $\frac{a}{a+b+c+d}$	64.6	57.2	42.6	39.1	52.3	68.5	77.9	50.5

Incidence of endemic dental fluorosis (mottled enamel).—The incidence and degree of mottled enamel observed in the groups studied is shown in table 9.

In accordance with a previously described method of computing a community mottled enamel index (*5*) on the basis of the percentage distribution of clinical severity, the approximate mottled enamel index of Elmhurst is "slight"; that of Maywood, Aurora, and Joliet, "border-line"; and that of Elgin, Evanston, Oak Park, and Waukegan, "negative."

TABLE 9.—*Incidence and distribution of endemic dental fluorosis (mottled enamel) according to the degree of affection*

Macroscopic signs of mottled enamel	Elmhurst	Maywood	Aurora	Joliet	Elgin	Evanston	Oak Park	Waukegan
	(A) Number							
Total examined	170	171	633	447	403	256	329	423
Absent:								
Normal	48	67	337	181	244	235	298	414
Questionable	54	47	201	153	142	17	29	8
Present:								
Very mild	51	50	88	99	14	4	2	1
Mild	15	7	7	14	3	0	0	0
Moderate	2	0	0	0	0	0	0	0
Severe	0	0	0	0	0	0	0	0
	(B) Percent							
Total examined	100.0	100.0	100 0	100.0	100.0	100.0	100.0	100 0
Absent								
Normal	28.2	39.2	53 2	40.5	60.5	91.8	90.6	97.9
Questionable	31 8	27.5	31 8	34.2	35.3	6.6	8.8	1.9
Present:								
Very mild	30.0	29.2	13.9	22 2	3.5	1.6	.6	.2
Mild	8.8	4.1	1.1	3.1	.7	0	0	0
Moderate	1 2	0	0	0	0	0	0	0
Severe	0	0	0	0	0	0	0	0
Incidence of affection	40.0	33.3	15.0	25.3	4.2	1.6	.6	.2

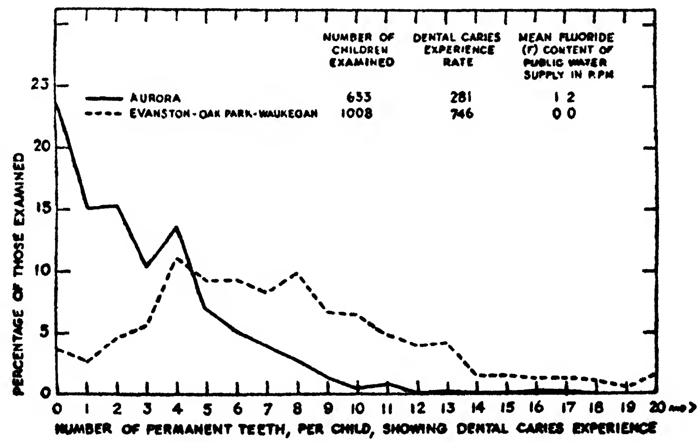


FIGURE 4.—Differences in the severity of dental caries attack.

Gradations in the amount of dental caries.—A study of the differences in the amount of dental caries between, for instance, Aurora, whose public water supply contains 1.2 p. p. m. of fluoride (F), and the communities using fluoride-free water (Evanston, Oak Park, and Waukegan) indicates that the vigor or force of the dental caries impact upon the selected populations studied varies widely. The 633 Aurora children showed a dental caries experience rate (permanent teeth) of 281 per 100 children; the 1,008 children at Evanston, Oak Park, and Waukegan, a rate of 746 per 100 children. The differences in the intensity of dental caries attack in Aurora and in the three other communities are shown in table 10 and figure 4.

TABLE 10.—*Differences in the severity of dental caries attack in selected school children at Aurora (Ill.), whose public water supply contains 1.2 p. p. m. of fluoride (F), and three communities (Evanston, Oak Park, and Waukegan) using fluoride-free water*

Number of permanent teeth showing dental caries experience in amounts as specified per child	Aurora			Evanston, Oak Park, Waukegan		
	Number of children	Percentage of total examined	Percentage of total (cumulative)	Number of children	Percentage of total examined	Percentage of total (cumulative)
0	149	23.5	23.5	37	3.7	3.7
1	95	15.0	38.5	27	2.7	6.4
2	97	15.3	53.8	46	4.6	11 0
3	66	10.4	64.2	57	5.6	16 6
4	87	13.7	77.9	113	11.2	27.8
5	44	7.0	84.9	94	9.3	37.1
6	33	5.2	90.1	95	9.4	46 5
7	25	3.9	94.0	84	8.3	54.8
8	17	2.7	96.7	101	10.0	64.8
9	8	1.3	98.0	68	6.7	71.5
10	3	.5	98.5	67	6.6	78.1
11	6	.9	99.4	49	4.9	83.0
12	0			40	4.0	87.0
13	1	.2	99.6	42	4.2	91.2
14	0			15	1.5	92.7
15	0			15	1.5	94.2
16	1	.2	99 8	13	1.3	95.5
17	1	.2	100.0	13	1.3	96 8
18				11	1.1	97.9
19				6	.6	98.5
20 and over				15	1.5	100 0
Total	633			1,008		

Dental caries experience, number per 100 children examined: Aurora—281; Evanston, Oak Park, Waukegan—746.

Bacteriological studies.—In order to learn whether or not group differences in oral lactobacilli counts existed in the eight communities studied, *L. acidophilus* counts were made on saliva samples from 1,761 of the 2,832 children examined. In each community a specimen of saliva was collected from a representative sample of children selected at random from the total of those who were examined clinically. The bacteriological studies were conducted by two of the authors (P. J. and F. A. A. Jr.).

All saliva samples were collected in a similar manner at the same time of day (between 10 a. m. and 11:30 a. m.). Paraffin was used to stimulate the flow of saliva; all children were instructed to chew in such a manner as to touch all the teeth in the mouth. The time required to collect the saliva was approximately 5 minutes in all cases. The dilution used for all specimens was 1 cc. of saliva to 4 cc. of broth; 0.1 cc. of this mixture was plated on tomato juice agar of pH 5. Plates were incubated for 4 days and the counts of the *L. acidophilus* colonies were made by one of the authors (P. J.).

For a more detailed analysis of the relationship between the clinical findings and the bacteriological results, a separate tabulation was made of the dental caries experience of those children included in the bacteriological studies. It is shown in table 11.

TABLE 11.—*Summary of the percentage incidence and dental caries experience, permanent teeth, in the 1,761 children for whom a single L. acidophilus count was made*

City	Number of children examined	Children showing dental caries experience	Children showing no dental caries experience	Dental caries experience, permanent teeth: Filled teeth (past dental caries) (a)	Untreated dental caries (b)	Extraction indicated (c)	Missing (d)	Total (a+b+c+d)
				(A) Number				
Elmhurst	154	112	42	220	147	7	7	381
Maywood	139	100	39	174	164	1	13	352
Aurora	340	255	85	360	556	7	34	957
Joliet	233	191	42	265	469	10	41	785
Elgin	250	223	27	529	536	7	41	1,113
Evanston	208	200	8	802	485	23	89	1,399
Oak Park	208	202	6	1,010	424	13	61	1,508
Waukegan	229	223	6	884	816	31	160	1,891
	Percent of total[1] examined clinically			(B) Number per 100 children				
Elmhurst	90.6	72.7	27.3	143	95	4.5	4.5	247
Maywood	81.3	71.9	28.1	125	118	.7	9.4	253
Aurora	53.7	75.0	25.0	106	164	2.1	10.0	281
Joliet	52.1	82.0	18.0	114	201	4.3	17.6	337
Elgin	62.0	89.2	10.8	212	214	2.8	16.4	445
Evanston	81.3	96.2	3.8	386	233	11.1	42.8	673
Oak Park	63.2	97.1	2.9	486	204	6.3	29.3	725
Waukegan	54.1	97.4	2.6	386	356	13.5	69.9	826

[1] Percentage of total children examined clinically (tables 5 and 6) who were examined bacteriologically.

TABLE 12.—*Summary of the percentage distribution of oral L. acidophilus in salivas from 1,761 school children in 8 suburban Chicago communities*

City	Distribution of children according to the number of *L. acidophilus* per cc. of saliva: Negative	Less than 100	100 to 1,000	1,000 to 3,000	3,000 to 12,000	12,000 to 21,000	21,000 to 30,000	30,000 and over	Total
	(A) Number								
Elmhurst	39	16	13	9	16	13	10	38	154
Maywood	35	20	14	10	17	8	6	29	139
Aurora	86	44	24	10	43	34	12	87	340
Joliet	61	22	20	6	24	26	12	62	233
Elgin	40	13	24	14	40	22	14	83	250
Evanston	19	13	19	2	28	29	11	87	208
Oak Park	24	14	13	14	27	19	6	91	208
Waukegan	21	13	13	6	27	15	9	125	229
	(B) Percent								
Elmhurst	25.3	10.4	8.4	5.9	10.4	8.4	6.5	24.7	100
Maywood	25.2	14.4	10.1	7.2	12.2	5.7	4.3	20.9	100
Aurora	25.3	12.9	7.1	2.9	12.7	10.0	3.5	25.6	100
Joliet	26.2	9.4	8.6	2.6	10.3	11.2	5.1	26.6	100
Elgin	16.0	5.2	9.6	5.6	16.0	8.8	5.6	33.2	100
Evanston	9.1	6.3	9.1	1.0	13.5	13.9	5.3	41.8	100
Oak Park	11.5	6.7	6.3	6.7	13.0	9.1	2.9	43.8	100
Waukegan	9.2	5.7	5.7	2.6	11.8	6.5	3.9	54.6	100

The quantitative distribution of the lactobacilli counts are shown in table 12.

In order to demonstrate graphically the quantitative distribution of the *L. acidophilus* counts the entire group was divided into three classes: Those children using a water supply containing more than 1 p. p. m. F (Elmhurst, Maywood, Aurora, and Joliet); children whose water supply contained 0.5 p. p. m. F (Elgin); and children using

PERCENTAGE DISTRIBUTION OF LACTOBACILLI IN THE SALIVA OF 1,761 CHILDREN EXAMINED IN EIGHT SUBURBAN CHICAGO COMMUNITIES GROUPED ACCORDING TO THE FLUORIDE (F) CONTENT OF THE PUBLIC WATER SUPPLY AND CLASSIFIED ACCORDING TO THE ESTIMATED NUMBER OF LACTOBACILLI PER CC. OF SALIVA

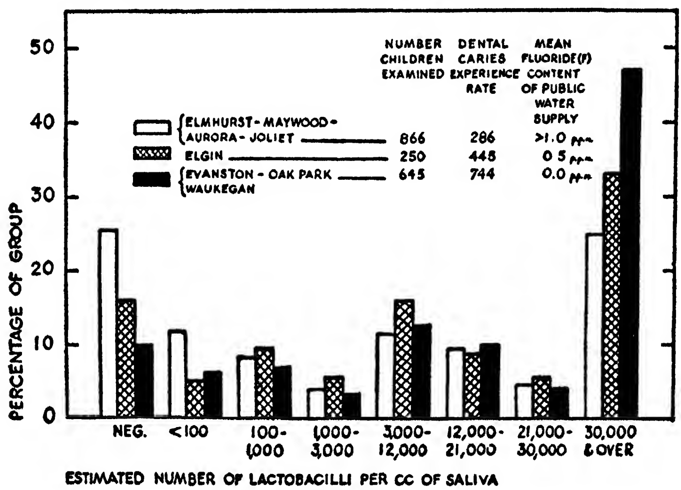


FIGURE 5.

water free of fluorine (Evanston, Oak Park, and Waukegan). This graphic presentation is shown in figure 5.

PUBLIC WATER SUPPLIES

Description of public water supplies.[10]—Description and data concerning these municipal water supplies were obtained from Mr. C. W. Klassen, chief sanitary engineer, State Department of Public Health, from the District Sanitary Engineers in whose districts the cities are located, from Bulletin No. 21, including Supplement No. 1 thereto, of the State Water Survey Division, and by interview with the local water superintendent. Description of these supplies follows.

Elmhurst.—The public water supply of Elmhurst is obtained from four drilled wells. Wells Nos. 1, 2, and 3 are located in the north central part of the city, No. 4 near the western city limits.

Well No. 1 was drilled in 1916 to a depth of 957 feet. Well No. 2 is located about 100 feet from well No. 1 and was drilled in 1919 to a depth of 1,398 feet. It enters the Eau Claire formation of the Cambrian system. In 1926–27 well No. 2 was deepened to 2,222 feet.

[10] For a proper evaluation of the reported clinical findings and their relation to the fluorine-dental caries hypothesis, detailed data regarding the common water supplies are included for the period of time concomitant with the life of the group examined.

Well No. 3 is located about two blocks from wells Nos. 1 and 2 and was drilled in 1925–26 to a depth of 2,077 feet, this level being designated in the log as the Mount Simon sandstone. In 1933 this well was deepened to 2,221 feet.

Well No. 4 was drilled in 1928, originally to a depth of 2,205 feet into the Mount Simon formation. In 1937 the lower part of this well was plugged in order to reduce the high sodium chloride content and the water is now being obtained from a depth of about 1,450 feet which is in the Eau Claire formation. Well No. 4 is used only sporadically, generally during the summer months.

At the time of the survey well No. 1 was emptying into a 150,000 gallon reservoir which has two leads, one to a large 1,000,000 gallon reservoir, the other direct to the mains. Well No. 1 is generally pumped between midnight and 6 a. m.; the water from this well is pumped directly into the mains during this period. Wells Nos. 2 and 3 supply most of the water used by the city between 6 a. m. and midnight.

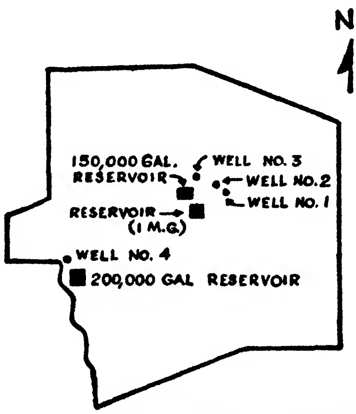


FIGURE 6.—Location of the wells in the city of Elmhurst.

A sample of water from each of these two wells, collected in December 1939, showed a fluoride (F) content of 1.3 and 2.2 parts per million, respectively. Another sample collected in September 1939, from a tap located at the City Hall showed a fluoride content of 1.8 parts per million.

Maywood.—The present Maywood supply is obtained from four drilled wells, designated as wells Nos. 3, 4, 5, and 6. Wells Nos. 1 and 2 were drilled about 1895; well No. 1 was abandoned about 1919, No. 2 about 1923.

Well No. 3 was drilled in 1910 and is 1,800 feet deep. Between 840 feet and 980 feet the St. Peter sandstone was penetrated and Cambrian sandstone entered at a depth of 1,400 feet. This well was repaired in 1931, the repair including the placing of 528 feet of 12-inch casing cemented in place for its entire length, and the reaming of the balance of the hole to 10 inches. Well No. 4 was completed in 1918 and is 2,048 feet deep. St. Peter sandstone was entered at a depth of 897 feet and the Cambrian sandstone at 1,400 feet. The well is cased 612 feet, about 50 feet into the Galena-Plattsville limestone. In 1937 the lower 30 feet was filled with cement. The discharges from wells Nos. 3 and 4 are softened (zeolite) and collected in the "north" reservoir.

Well No. 5 was drilled in 1922 and is 2,076 feet deep. This well is 17 inches in diameter at the top and is cased to a depth of 545 feet. A 10-inch liner is placed between depths 1,040 feet and 1,100 feet. This well is 10 inches in diameter at the bottom where it enters the Mount Simon of the Cambrian system. Apparently no changes have been made in this well since its original installation

except for a cleaning out in 1938. Well No. 6 was drilled in 1924 to an original depth of 2,090 feet but in 1937 this was filled back to a depth of 1,549 feet. The bottom of the original hole was filled with 40 feet of concrete, and after shooting the well at 1,440 to 1,470 feet about 455 feet of sand and clay was allowed to fill

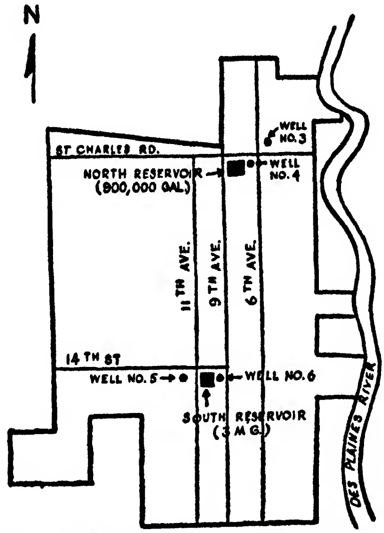


FIGURE 7.—Location of wells in the village of Maywood.

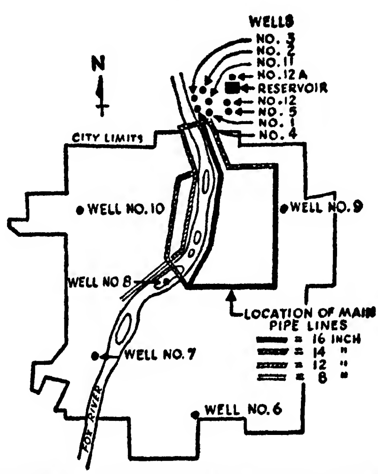


FIGURE 8.—Location of wells in the city of Aurora.

the well. Then more cement was added to seal the lower part of the well. The chloride content was reduced by this procedure from 1,500 to 250 parts per million. This well is cased to a depth of 556 feet. Wells Nos. 5 and 6 are located about a mile and a half from wells Nos. 3 and 4. The discharges from wells Nos. 5 and 6 are softened (zeolite) and collected in the "south" reservoir. The gravity open-type softening plant and chlorination was installed in 1938.

Aurora.—The common water supply of Aurora is obtained from nine wells, four of which (Nos. 5,[11] 11, 12, and 12A) pump into a collecting reservoir and thence to the distribution system. This reservoir and well field is located just outside the city limits, north of the city. The remaining wells (Nos. 6, 7, 8, 9, and 10) are located in different sections of the city. All pump directly into the distribution system with the exception of well No. 10, which pumps to the distribution system through a sand-collecting reservoir. Although there are several points in the distribution system where the water from several wells mix, these points are very indefinite as wells are not operated at the same time nor for the same length of time. From the pumping records of the Water Department, wells Nos. 11, 12, and 12A (distributed from the common reservoir) have furnished during 1935, 1936, 1937, 1938, and the first nine months of 1939, 56, 49, 68, 70, and 61 percent, respectively, of the water pumped (no water was pumped from the recently repaired well No. 5 during this period). Water from the main pumping station (wells Nos. 11, 12, and 12A) passes to the center of the city through main pipe lines lying east and west of the Fox River. Water from this source reaches all parts of the city, although in certain sections there is some mixture of waters from those wells pumping directly into the distribution system. The location of the wells, the reservoir, and the main pipe lines are shown in figure 8.

Wells Nos. 1 to 4, inclusive, drilled between 1891 and 1895, are now abandoned and plugged. Their site is close to the present location of wells Nos. 5, 11, 12, and 12A. Data with respect to these wells follow:

Well No.	Year drilled	Depth in feet	Remarks
1	1891	1,388	Deepened in 1898 to 2,230 feet. A report in city water department gives the depth as 2,250 feet.
2	1892	2,230	
3	1893	2,230	
4	1895	2,230	

The record with respect to the wells now in use follows:

Well No.	Year drilled	Depth in feet	Well No.	Year drilled	Depth in feet
5	1910	2,250	10	1923	2,290
6	1915	2,185	11	1928	2,253
7	1916	2,250	12	1929	2,260
8	1916	2,280	12A	1936	2,250
9	1923	2,259			

In the preliminary studies, samples were collected from the common reservoir (wells Nos. 11, 12, and 12A) and from each of the wells Nos. 6 to 10, inclusive. The monthly water samples for a year were collected from the main pumping station (wells Nos. 11, 12, and 12A). On the basis of the 12 months' pumping records for 1938, the percentages of water pumped were calculated and are shown with the fluoride (F) content of each supply in the following table (p. 782).

The Aurora water supply is not treated except for provisions for emergency chlorination.

From the standpoint of a population exposed for a long period of time to a public water supply containing small amounts of fluorides, Aurora appears to offer many advantages for epidemiological study. Since 1898 the public water supply has been obtained from wells into the Cambrian "Potsdam" sandstone.

[11] Well No. 5 was out of commission for a number of years. New pumping equipment was recently installed, and this well was put back into permanent operation August 19, 1940.

Well No.	Percent contributed by each well and main group of wells to the total amount of water used in Aurora during 1938	Fluoride (F) content in p. p. m. of samples collected in August 1939
11, 12, and 12A	70	1.2
10	1	1.1
9	7	1.3
8	8	1.3
7	9	.7
6	5	.5

Joliet.—At the time of the survey the Joliet water supply was being obtained from three wells, Washington Street wells Nos. 1 and 2, and from the Ottawa Street well. The water supply of this city has undergone a number of physical

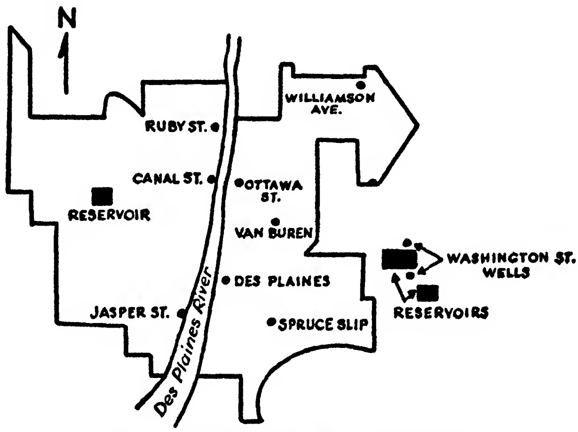


FIGURE 9.—Location of wells in the city of Joliet.

changes during the past 12 to 14 years, but an analysis of such information as is available does not indicate any marked change in the fluoride (F) content of the water used by the inhabitants. During this period the water supply of Joliet was largely obtained from wells into the Cambrian sandstone, an aquifer whose waters often contain small amounts of fluorides. Weart and Klassen (*3*) in 1937 reported, on the basis of seven samples collected in 1936, that the fluoride content of this public water supply was 1.4 p. p. m. The samples collected during the past year show a mean fluoride content of 1.3 p. p. m. The degree of mottled enamel observed in the 12–14-year-old children examined in this survey would reflect the fluoride concentration of the public water in use roughly 9 to 12 years ago. The percentage incidence of affection observed points to a concentration in the neighborhood of 1.3 to 1.4 p. p. m. Hence, with the exception of the summer of 1930, which will be discussed later, both chemical and epidemiological evidence would suggest that the fluoride (F) content of the water used in this community did not differ greatly from the range of concentration stated.

The following wells have contributed to the Joliet water supply:

Name of well	Depth in feet	Year drilled	Year last in use	Name of well	Depth in feet	Year drilled	Year last in use
Washington St.:							
Well No. 1	1,608	1937	(1)	Van Buren St.	1,550	1913	1935
Well No. 2	1,704	1900	(1)	Des Plaines St.	1,560	1913	1937
Ottawa St.	1,627	1907	(1)	Ruby St.	1,564	1915	1937
Canal St.	1,570	1911	1931	Jasper St.	1,565	1930	1938
Spruce Slip	1,530	1912	1931	Williamson St.	1,588	1925	1938

1 In use at present.

Washington Street well No. 2 and the Ottawa Street well were repaired in 1937. Water from Washington Street wells Nos. 1 and 2 pass through a common collecting reservoir. During the period 1925–39, certain wells now not in use were being pumped directly into the distribution system.

In May 1930, because of a break-down in the Williamson Avenue (Charlesworth Avenue) well, the public water supply was supplemented by water pumped from a quarry known as "Michigan Beach" and located on the south edge of the city. Up to the time of its use for drinking water it had been used for swimming-pool water. The quarry was of unknown depth and presumably was fed by springs. This water was chlorinated before being turned into the distribution system. According to the records of the State Department of Public Health about 1,000,000 gallons of water per day were used from the quarry and this continued for several months. The quarry water contributed about 25 percent of the water used by the inhabitants during this period. There is also a record of certain shallow wells, now abandoned, having constituted part of the city water supply.

At present the Washington Street wells supply a little over half of the water used in the city; the Ottawa Street well supplies the remainder. In the preliminary studies a sample of water from a tap in the Woodruff Hotel (southeastern section of the business district where water usage is high and located so that mixing of the two water supplies is obtained) showed on analysis a fluoride (F) content of 1.2 parts per million.

The present Joliet water supply is chlorinated.

Elgin.—Since 1905 Elgin has obtained its public water supply from ground water sources, previously from the Fox River. At present practically all of the water is obtained from six wells. Four of these wells are at the north end of the city (Main Station, Slade Avenue) and two in the southeastern section of the city (Lavoie Avenue well and the St. Charles Street well). In addition, the Creighton Avenue well and the Schuler Street well supply varying amounts, pumping directly into the distribution system.

Water from the four north wells passes through a softening plant to a reservoir and thence to the distribution system. In the southeastern part of town there is an aerator and settling reservoir at the site of the St. Charles Street well and the water from the Lavoie Avenue well, in addition to water from the St. Charles Street well, is regularly pumped over and through this aerator and reservoir before passing into the distribution system.

The major portion of the supply has been obtained for a number of years from the four north wells. For the years 1932, 1933, 1934, 1935, 1936, 1937, 1938, and 1939 the pumping records of the Water Department show that these four wells supplied 84, 78, 72, 71, 69, 65, 62, and 64 (estimated) percent, respectively, of the total amount of the water pumped.

When first installed these four wells ranged in depth from 1,300 to 2,000 feet. Between 1905 and 1917 certain changes were made by filling in the lower parts of the wells. In 1926 the wells were deepened and cleaned out to a depth of 1,960 feet and cased to a depth of about 122 feet. The four wells penetrate the Cambrian sandstone.

The southeastern section of the city is largely supplied with water from the Lavoie Avenue well and the St. Charles Street well. The former was drilled in 1931 to a depth of 675 feet and since 1933 has accounted for an increasing percentage of the water used. The St. Charles Street well is 100 feet deep and was drilled in 1933, replacing one at the same location drilled in 1921 to a depth of 101 feet. During July 1940, the St. Charles Street well furnished nearly 5 percent of the total pumpage from all wells, in August, about 1.8 percent.

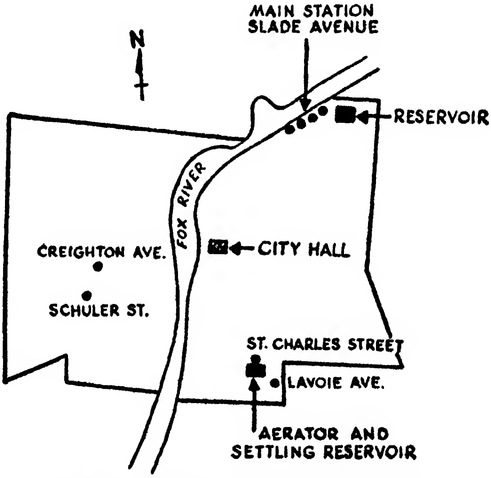


FIGURE 10.—Location of wells in the city of Elgin.

The Schuler Street well, 1,960 feet deep and installed in 1932, is pumped irregularly, being used largely for standby purposes. This well and the nearby Creighton Avenue well pump directly into the distribution system. The Creighton Avenue well [13] is 48 feet deep. The date of its installation is not known, but it was reported in operation as early as 1928. During April, May, June, and July 1940, the Creighton Avenue well furnished 4.7, 9.6, 4.1, and 1.2 percent, respectively, of the total pumpage from all wells.

The two shallow wells (Creighton Avenue and St. Charles Street) supplied between 1934 and 1938 as much as 10 to 25 percent of the water pumped.

As has been noted, there is no common reservoir to which the water is pumped prior to turning it into the distribution system, and the southeastern section in all probability used a water differing in mineral composition from that used in the rest of the city. In the preliminary studies, samples were collected of the treated water at the Main Station (Slade Avenue), another at the City Hall, which is about the center of the mixed area, and should represent a sample of the

[13] A sample from this well collected in December 1939 showed a fluoride (F) content of 0.5 p. p. m.

mixture of the water from both ends of town, and a third sample from the reservoir served by the two wells at the south end of the city. These samples showed a fluoride (F) content of 0.4, 0.4, and 1.0 part per million, respectively. In 1938 a water softening plant using the lime process was installed for the treatment of the public water supply. About 15.6 grains of lime and ½ grain of alum per gallon are applied, followed by chlorination.

In order to learn whether the softening treatment was materially influencing the fluoride content of the water from the four north wells (Slade Avenue Station) raw (untreated) water samples were collected during November 1940 from wells Nos. 1, 2, 3, and 4; the fluoride (F) content of these samples was 0.7, 0.6, 0.5, and 0.5 part per million, respectively. Klassen[13] states that tests made in 1936 of two samples from the Slade Avenue Station showed a fluoride content of 0.7 and 0.5 part per million. A sample at the same time from the St. Charles Street well showed a fluoride content of 1.2 parts per million.

Evanston.—The supply is obtained from Lake Michigan and is treated in a modern water purification plant by mixing, settling, rapid sand filtration, and chlorination. The mixing period is about 17 minutes, followed by a 2-hour settling period. There are 12 rapid sand filters, each having a capacity of 1,400 gallons per minute. About 0.7 grains per gallon of alum is applied for coagulation purposes and 0.3 parts per million of chlorine for sterilization. From 1874 to 1911, when chlorination by the use of hypochlorite of lime was started, the supply was obtained direct from Lake Michigan without any treatment. In 1914 a modern water purification plant was constructed, which was enlarged and improved in 1924.

Oak Park.—Since 1912 the water supply has been obtained from the city of Chicago, the source of this supply being Lake Michigan. This water is chlorinated at Chicago and rechlorinated at Oak Park. Previous to 1912 Oak Park obtained its water supply from deep wells.

Waukegan.—The supply is obtained from Lake Michigan and is treated in a modern water purification plant by aeration, mixing, settling, rapid sand filtration, post aeration, and chlorination. The mixing period is about 5 minutes followed by a period of 3 hours settling; there are 10 rapid sand filters, each having a capacity of 728 gallons per minute. About one grain per gallon of alum is applied for coagulation purposes and 0.3 part per million of chlorine for sterilization. From 1895 to 1929, when the filtration plant was placed in operation, the supply was obtained from Lake Michigan. Previous to 1895 the water supply was obtained from artesian wells.

Other data.—Inasmuch as Oak Park procures its water from the city of Chicago, as does Cicero and numerous other communities in the metropolitan area, three samples were collected during 1939–40 from taps in Cicero having average domestic use, and seven monthly samples were collected during 1940 from a tap in the Chicago distribution system. The three Cicero samples showed 0.1, 0.0, and 0.0 part per million of fluoride; all seven of the Chicago samples showed a fluoride content of 0.0 part per million.

The study published in 1937 by Weart and Klassen (*3*) reported hat the public water supplies of Elmhurst, Maywood, Aurora, Joliet, and Elgin contained 2.0, 1.6, 1.0, 1.4, and 0.9 parts per million of fluorides, respectively. They noted that in the case of ground water

[13] Personal communication dated December 1940.

sources a sample from each well then in service was examined, the value reported for each community representing an arithmetical mean of the several determinations.

Chemical analyses of the common water supplies.—Samples of the common water supplies were collected, generally monthly, during 1939–40. The percentage incidence of mottled enamel and the degree of clinical affection in the age group studied should closely reflect the fluoride (F) content of the water used approximately 9 to 12 years previously.[14] On the basis of the presumptive evidence of observed endemic dental fluorosis (mottled enamel), the fluoride content of the public water supplies in use 9 to 12 years ago in these communities was approximately of the same order of fluoride concentration as found in this survey, with the exception of Maywood. At Maywood an incidence of mottled enamel of 33 percent was observed, a degree of affection that would suggest that the water used during the period when these teeth were calcifying had a fluoride (F) concentration of about 1.4–1.6 parts per million, a concentration close to that (1.6 p. p. m.) reported by Weart and Klassen (*3*) in 1937. Physical changes occurring several years ago in certain of the Maywood wells may account for the fact that the mean fluoride (F) content of the samples reported in this paper was 1.2 parts per million.

Klassen [15] states that samples of water collected in 1936 from Maywood wells Nos. 3, 4, 5, and 6 showed a fluoride (F) content of 1.2, 1.3, 1.8, and 1.8 parts per million. These water samples were collected prior to the installation of the softening treatment and the marked changes made in well No. 6. Raw water samples collected during 1939–40 (not included in table 13) from each of these wells and analyzed by one of us (E. E.) showed fluoride (F) concentrations, in parts per million, as follows: Well No. 3, 1.1 and 1.4; well No. 4, 1.6; well No. 5, 1.3; and well No. 6, 1.1.

A marked difference was noted in the fluoride concentration of the two north wells in contrast to the two south wells, but individual pumping records showing the amount contributed by each of the four village wells for the past 5 years were not available.

The fluoride content of these waters was estimated colorimetrically by means of the zirconium-alizarin reagent (*6*). The results are given in table 13.

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[14] A more precise correlation is possible if single age groupings are studied; even more precision is possible if the signs of mottled enamel in single tooth groupings are considered in relation to the period of enamel calcification as outlined by Logan and Kronfeld. Under these conditions it is possible in the case of certain teeth of the 14-year-old group to estimate the fluoride content of the water used 12 to 14 years previously. Hence, "9 to 12 years previously" is merely an approximation of a prior time period, useful in evaluating certain aspects of the study.

[15] Personal communication dated December 30, 1940.

TABLE 13.—*Fluoride (F) content of public water supplies in the 8 suburban Chicago communities studied*

All samples collected from a tap in the distribution system having average domestic use unless otherwise specified]

Source	Ground water					Lake Michigan		
City or village	Elmhurst	Maywood	Aurora [2]	Joliet	Elgin [3]	Evanston	Oak Park	Waukegan
	Parts per million							
December 1939	1.6	----------	1.2	[6] 1.3 [7] 1.2	0.4	0.1	0	0
January 1940	(1)	----------	1.2	[6] 1.3 [7] 1.2	.5	0	0	0
February	2.0	0.9	1.1	1.3	.5	0	0	0
March	----------	----------	1.2	----------	.4	0	----------	0
April	2.0	[4] 1.1 [5] 1.0	1.2	1.3	.4	0	0	0
May	----------	----------	1.2	1.2	.5	0	----------	0
June	1.6	*1.4 *1.1	1.2	1.4	.5	0	*0 *0	0
July	*1.8 *1.9	*1.0 *1.5	1.2	*1.3 *1.3	.4	.1	*0 *0	0
August	----------	----------	1.2	----------	.5	0	----------	0
September	1.9	1.4	1.2	1.3	.4	0	0	----------
October	1.6	1.1	1.3	1.2	.5	0	0	*0 *0
November	*1.8 *1.8	*1.1 *1.4	1.3	*1.1 *1.1	.4	0	*0 *0	----------
Mean	1.8	[8] 1.2	1.2	1.3	.5	0	0	0

*At times the exigency of other duties prevented the district engineer from collecting the sample during the month specified. When two determinations marked by an asterisk (*) are shown for one month, it indicates that two samples were collected during that month, generally about 2 weeks apart.

[1] Container broken.

[2] All samples collected at main pumping station (wells Nos. 11, 12, 12A, and, recently, 5).

[3] All samples collected at the Elgin City Hall; mixture of water from both ends of town.

[4] North reservoir.

[5] South reservoir.

[6] Ottawa St. well.

[7] Washington St wells

[8] There is both presumptive and direct evidence that prior to a few years ago the water supply used in Maywood probably contained 1.4 to 1.6 p. p. m. of fluoride (F). See text.

As was customary in other quantitative surveys, analyses were made of constituents other than the fluorides. Results of these chemical analyses are given in table 14.

TABLE 14.—*Mineral analyses of the common water supply of each of the 8 suburban Chicago communities studied* [1]

	Elmhurst	Maywood	Aurora	Joliet	Elgin	Evanston	Oak Park	Waukegan
	Parts per million							
Residue on evaporation	737.6	723.2	729.6	566.0	180.0	153.6	152.8	155.2
Loss on ignition	60.8	96.8	107.2	82.8	33.6	34.0	35.6	30.4
Fixed residue	676.8	626.4	622.4	483.2	146.4	119.6	117.2	124.8
Silica (SiO_2)	10.0	11.5	18.4	6.0	26.4	8.0	8.0	4.0
Iron (Fe)	.05	.05	.08	.06	.06	.03	.05	.03
Aluminum (Al)	0	0	0	0	0	.04	0	0
Calcium (Ca)	86.9	20.0	85.5	89.2	14.9	33.7	33.7	34.9
Magnesium (Mg)	25.9	6.1	28.0	30.8	15.9	11.4	11.7	11.5
Sodium and potassium (calculated as Na)	149.8	210.7	130.3	70.5	25.2	3.5	4.4	4.4
Carbonate (CO_3)	0	0	0	0	15.4	0	0	2.4
Bicarbonate (HCO_3)	350.1	351.4	313.5	351.4	103.0	135.4	139.0	139.0
Sulfate (SO_4)	98.1	138.2	48.0	145.8	30.3	23.4	16.8	23.0
Nitrate (NO_3)	.97	.94	1.42	1.59	.33	.62	.46	.89
Chloride (Cl)	180.0	60.0	218.0	31.0	8.0	4.0	5.0	4.0
Phosphate (PO_4)	0	.3	0	0	0	0	0	0
Fluoride (F)	1.8	1.4	1.2	1.2	.4	0	0	0

[1] These samples of water from Aurora and Elgin were received in August 1939; the samples from Elmhurst, Joliet, Evanston, Oak Park, and Waukegan in October 1939, and that from Maywood in June 1940.

Assistant Chemist C. G. Remsburg carried out the determinations other than fluoride, using mostly the methods given in the Standard Methods of Water Analysis of the American Public Health Association. The phosphate was determined colorimetrically by an adaptation of the Benedict and Theis method (J. Biol. Chem., 61: 63 (1924)). The limit of the sensitivity of the procedure used for the fluoride determination may be considered as about 0.1 part per million.

DISCUSSION

General findings.—Marked differences in dental caries experience have been demonstrated in selected population groups (children of continuous residence and continuity of exposure) residing in eight communities in the suburban Chicago area. Considering the relative homogeneity of the population and the sampling method followed, it is difficult from an epidemiological standpoint to attribute these differences to any cause other than the mineral composition of the public water supply. A summary of the findings of this study is shown in table 15.

With respect to the conjectural relationship of the amount of sunlight to dental caries it might be noted that the city (Waukegan) with the highest dental caries experience rate (810) showed the fewest number of cloudy days and was next to Aurora in having the greatest number of clear days.

The characteristic difference in the percentage incidence and dental caries experience rates, proximal caries rates, and amounts of *L. acidophilus* present in the saliva showed no outstanding differences from that observed in the Galesburg-Quincy (Ill.) study (*2*).

TABLE 15.—*Summary of dental caries findings in 2,832 selected white children, aged 12–14 years, in 8 suburban Chicago communities in relation to the fluoride (F) content of the public water supply*

City or village	Elmhurst	Maywood	Aurora	Joliet	Elgin	Evanston	Oak Park	Waukegan
Sampling:								
Total number of 12-14-year-old children present at time of sampling	633	873	1,625	1,412	1,030	2,125	1,662	1,354
Number of 12-14-year-old white children whose histories on repeated questioning indicated continuity of exposure and who were examined	170	171	633	447	403	256	329	423
Percentage of the total present who were examined	26.9	19.6	39.0	31.7	39.1	12.0	19.8	31.2
Water supply:								
Source	Deep wells					Lake Michigan		
Permanent hardness in parts per million	323.4	75.0	328.5	349.8	102.6	131.0	132.2	134.4
Mean fluoride (F) content, 1939-40, in parts per million	1.8	[1] 1.2	1.2	1.3	.5	0	0	0
Clinical examination:								
Dental caries experience, permanent teeth, per 100 children examined	252	258	281	323	444	673	722	810
Dental caries experience, proximal surfaces, superior incisors, per 100 surfaces	0.60	0.59	0.78	1.3	4.1	10.7	9.0	17.7
First permanent molar mortality, per 100 children examined	11.8	11.7	14.5	19.5	20.3	42.6	31.0	79.9
Percentage of children with no dental caries experience	25.3	29.8	23.5	18.3	11.4	3.9	4.3	3.1
Percentage incidence of endemic dental fluorosis (mottled enamel)	40 0	33.3	15.0	25 3	4 2	1.6	.6	.2
Bacteriology:								
Percentage of those examined bacteriologically whose salivary *L. acidophilus* counts were:								
Negative and <100	35.7	39.6	38.2	35.6	21.2	15.4	18.2	14.9
30,000 and >	24.7	20.9	25.6	26.6	33.2	41.8	43.8	54.6

[1] There is both presumptive and direct evidence that prior to a few years ago the Maywood water contained probably 1.4–1.6 p. p. m. of fluoride (F). See text.

Low dental caries experience associated with the use of fluoride waters near the minimal threshold of mottled enamel.—The location of these communities and the fluoride concentrations of their public water supplies make them peculiarly fitted for epidemiological study of the relationship of fluoride concentration in the domestic water supply to the amount of dental caries experience. The most pertinent finding of the study was the disclosure that water supplies, the fluoride concentrations of which were not far from the minimal threshold of endemic dental fluorosis, 1.0 p. p. m. of F (e. g., Aurora, 1.2 p. p. m.), were associated with unusually low dental caries experience rates. Thus, the dental caries inhibitory factor, presumably present in the water and probably fluoride, was operative at levels where mottled enamel per se was of minimal public health and no esthetic significance. On the other hand, the three communities using the fluoride-free waters were all characterized by high dental caries experience. This suggests that fluoride levels even under 1.0 p. p. m. of F influence dental caries experience. The importance of adequate quantitative data respecting dental caries rates in communities whose public water supplies contain fluoride (F) near or under 1.0 p. p. m. needs no further emphasis.

The fact that low dental caries experience rates were found associated with the use of domestic waters, the fluoride content of which was in the neighborhood of 1.0 p. p. m., naturally brings forth the question of the amount and degree of mildness of the mottled enamel that may follow the continuous use of a domestic water of such concentrations. Examination of an adequate sample of children in communities having the requisites for quantitative evaluation (*7*) has consistently shown that there is a quantitative relation between the fluoride concentration of the water and the degree of clinical affection (*8*, cf. ogive, fig. 2), the action on the group roughly following general pharmacological observations respecting dosage and effect.

From the data of numerous studies (*9*) one would expect that the examination of an adequate group continuously using a domestic water containing 1.0 p. p. m. of fluoride (F) would show about 88 to 90 percent entirely free of macroscopic signs of mottled enamel. In the remainder (10 to 12 percent), some of the teeth would show the "very mild" types of mottled enamel, generally in the bicuspids and second molars.[16]

In communities where the public water supplies contain fluorides just in excess of the minimal threshold (1.0 p. p. m. of F) the reporting of the degree of prevalence as a percentage incidence of the group of

[16] It is, of course, possible that in some few regions of the United States where climatological conditions such as high mean annual temperature, humidity, wind velocity, etc., may introduce factors conducive to a higher water consumption and higher fluoride intake, a water containing 1.0 p. p. m. of fluoride (F) might be found associated with a higher percentage incidence of affection than that stated.

children examined actually overstates rather than understates the degree of affection in the group. Aurora may serve as a case in point. Among the 633 children (table 9) an incidence of mottled enamel of 15 percent was recorded, a child being classified as having mottled enamel when a positive diagnosis of mottled enamel was made for as few as two teeth. Now an incidence of 15 percent in the Aurora children should not be construed as meaning that 15 percent of the tooth population of this group showed positive signs of mottled enamel. Actually, of the 16,448 permanent teeth erupted and in position, a positive diagnosis of mottled enamel[17] was possible only in the case of 845 teeth (5.1 percent), 768 (4.7 percent) being "very mild" and 77 (0.4 percent) "mild." The few evidences of dental fluorosis observed were almost exclusively in the bicuspids and second molars; of the 845 teeth diagnosed as positive, only 57, or 6.7 percent, were incisor teeth.

General dietary likeness, exclusive of water.—Regarding the question of the relationship of diet to dental caries, it seems reasonable to assume that the food habitually consumed by these populations follows a general likeness. Hence, considering the sampling method used, it would seem unlikely that the marked differences in dental caries experience were due to differences in the food used in the communities. One would not expect to find gross dietary differences, with the exception of the domestic water, for example, between the children of Oak Park and Maywood, communities within a radius of about a mile. Or again, it would not seem reasonable to assume that the dietary regime (water excluded) of the 633 Aurora children was sufficiently different from that of the 423 Waukegan children to account for a difference in dental caries experience rates of about 188 percent (281 in Aurora and 810 in Waukegan).

Possible relation to the practice of dentistry.—As constituted at present, dentistry's main function might be defined as: (*a*) The clinical control of dental caries by means of fillings; (*b*) the extraction of teeth because of previous attack by dental caries; and (*c*) the attempt to restore, by operative and prosthetic means, teeth lost as a result of dental caries. Thus variations in the intensity of dental caries attack bear important consequential relationships to the practice of dentistry, influencing as it does not only the community's dental needs but the kind of dentistry practiced. By referring to figure 3 and studying the filled tooth rate and the missing rate it may be quickly seen how widely different were the amounts of dental service rendered in these different

[17] It might be noted that no instances of "moderate" (brown stain) or "severe" (discrete or confluent pitting) were observed. A diagnosis of "very mild" is made when a few small white opaque areas are observed involving less than 25 percent of the affected tooth, generally showing on the tip of the cusp of the bicuspids and second molars.

communities.[18] For instance, the filled tooth rate in any of the three communities using fluoride-free water is greater than the total dental caries experience in any of the communities (Elmhurst, Maywood, Aurora, Joliet) whose public water supplies contain from 1.2 to 1.8 parts per million of fluoride (F). The influence of the intensity of dental caries attack, manifested by markedly different dental caries experience rates, may be found on further study to have an important bearing on both the proper distribution of dentists and the type of dentistry practiced.

The demonstration of the variation in dental caries experience among selected urban population groups opens up important avenues pertinent to the possibility of control of this highly prevalent disease.

SUMMARY

1. A negative correlation between the fluoride (F) concentration of the public water supply and the dental caries experience of children continuously exposed to such waters is reported. A study of eight suburban Chicago communities discloses marked differences in the amount of dental caries. The dental caries experience rates in Elmhurst, Maywood, Aurora, and Joliet, whose public water supplies contain 1.8, 1.2,[19] 1.2, and 1.3 parts per million of fluoride (F), respectively, were 252, 258, 281, and 323, respectively. At Evanston, Oak Park, and Waukegan, using fluoride-free water, the dental caries experience rates were 673, 722, and 810, respectively.

2. Using the proximal surfaces of the four superior permanent incisors as a basis of measurement, there was 14.3 times as much of this type of dental caries in the 1,008 children from Evanston, Oak Park, and Waukegan as in the 1,421 children from Elmhurst, Maywood, Aurora, and Joliet.

3. The differences in the counts of *L. acidophilus* in the saliva corresponded to the differences in the dental caries experience in the groups of communities studied.

4. Considering the relative homogeneity of these urban populations and the sampling method followed, it is difficult from an epidemiological standpoint to ascribe these observed differences to any cause other than the common water supply.

5. The dental caries inhibitory factor, presumably fluoride, was operative at such low concentrations (e. g., 1.2 p. p. m. of F in Aurora) that mottled enamel as an esthetic problem was not encountered.

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[18] It is important to remember, however, that these comparisons are made among highly selected population groups (children of continuous residence). The influence of such marked dental caries differences in selected children upon the dental caries experience of all children in the community has not as yet been determined.

[19] There is evidence to indicate that prior to a few years ago Maywood water probably contained 1.4 to 1.6 p. p. m. of F.

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Acknowledgment is especially made to the numerous educational authorities in each of these eight communities. But for their wholehearted interest and cooperation, this study could not have been made. Special thanks are tendered to Dr. Moreland Emerson, Division of Dental Health Education, whose efforts did much to insure the success of this study.

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THE APPLICATION OF THE HUMAN SERUM OPACITY REACTION FOR EVALUATING THE ANTITOXIN BINDING POWER (LB) OF *CLOSTRIDIUM PERFRINGENS* (TYPE A) TOXOID [1]

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Perfringens toxoids are now used for the production of antitoxin in horses; it is also possible that they could be used for human immunization if suitable toxoids are produced. Thus, for both practical as

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well as theoretical reasons, it is important to know their antitoxin binding power *in vitro*, which would give a fair measure of their antigenic capacity *in vivo*. While the titrations of diphtheria and tetanus toxoids can be carried out with fair accuracy by means of the flocculation test, the latter has not been successfully applied with unconcentrated perfringens (type A) toxin or toxoid. Recently, Weil and Parsons (1939) (*1*) succeeded in obtaining a flocculation reaction with perfringens toxin concentrated 16 to 35-fold by ultrafiltration through 8 percent parlodian membranes. Our preliminary attempts to carry out the flocculation test with formalinized toxoid concentrated by ultrafiltration, however, were unsuccessful.

In 1933 Walbum and Reymann (*2*) attempted to determine the antitoxin binding properties of perfringens toxoids by allowing the antitoxin and the toxoids first to react with each other for a given period, then adding a known toxin, and determining the toxicity, after a further binding period, by injecting animals (Schmidt and Scholz L_{BA} method (*3*)). They concluded, however, that the method was not applicable to perfringens toxoids as the toxoids used had very poor antitoxin binding power. Thus we have left the method of titrating the toxoid by injecting into animals, and then, after an interval, testing the animals for immunity.

Recently we have obtained consistent and reproducible results in the titration of M. L. D. and L+ doses of perfringens type A toxin by means of the opacity test with inactivated normal human serum as introduced by Nagler in 1939 (*4*). We have applied this method for carrying out *in vitro* titrations of the antitoxin binding power (Lb) of perfringens toxoids and have met with considerable success. It is an easy and quick method and the results can be obtained within 24 hours.

The purpose of this communication is to report the method and the results obtained with several samples of formol-toxoids made from perfringens type A toxins.

METHOD

As the toxoids are completely inactive to the measurable methods of titrating toxins, such as by lethal, hemolytic, necrotic, or the opacity test, the present method of titration requires the addition of a toxin of known strength to the experimental mixtures of toxoid and antitoxin. Thus variable amounts of toxoid were mixed with different quantities of the standard antitoxin and after incubating at room temperature for about 4 hours a fixed quantity of the standard toxin was added to each mixture, followed one-half hour later with inactivated normal human serum and then incubated 16 hours at 37° C. The results were read the next morning. After several preliminary experiments the following method was finally adopted:

One-tenth cc. of undiluted toxoid (only concentrated toxoids are required to be diluted depending on the amount of concentration) was added to variable amounts of the standard antitoxin (usually 0.05 cc. to 0.8 cc. of a 1 in 300 dilution of the standard perfringens type A antitoxin of 50 units per cc.) and the volume brought up to the maximum quantity of antitoxin used with physiological salt solution, and left at room temperature for 3 to 4 hours. At the end of this period 0.1 cc. of the standard toxin diluted in borate buffered saline pH 6.6 to contain one L+ dose per cc. was added, followed one-half hour later by 0.1 cc. of inactivated normal human serum. Another row of tubes containing variable doses of the same standard antitoxin (usually 0.05 cc. to 0.25 cc. of a 1:300 dilution) and 0.1 cc. of the same toxin dilution and the required amount of physiological salt solution were incubated for 1 hour at room temperature and then 0.1 cc. of the inactivated normal human serum was added to each tube simultaneously with the toxoid tubes and all of them were left in the incubator at 37° C. for 16 hours. The readings were taken the next morning. The end point in the toxoid-antitoxin mixture was the tube containing the largest amount of antitoxin showing cloudy opacity. Similarly in the control standard toxin-antitoxin mixtures the end point was taken as the tube containing the largest amount of antitoxin showing equivalent opacity and the results were interpreted by interpolation as shown in the following sample protocol.

PROTOCOL 1.—*Toxoid SR61*

Tube No.	1	2	3	4	5	6	7	8	9	10	11	12	13
	cc.	cc.	cc.	cc.	cc.	cc.	cc.	cc.	cc.	cc.	cc.	cc.	cc.
Standard antitoxin 1:300	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.25	0.2	0.15	0.1	0.05
Toxoid SR61 undiluted	.1	.1	.1	.1	.1	.1	.1	.1	0	0	0	0	0
Physiological saline	.0	.1	.2	.3	.4	.5	.6	.7	.55	.6	.65	.7	.75
	Incubated at room temperature for 4 hours												
Standard toxin 30, 1.5 mg. per cc.	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
	Incubated at room temperature for:												
	½ hour								1 hour				
Inactivated pooled normal human serum	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
	Incubated at 37° C. for 16 hours												
Overnight readings	0	0	0	0	+	+++	+++	+++	0	0	0	+	+++

+, ++, +++, ++++ indicates gradation of turbidity.

Interpretation of results.—In the above protocol the end points in the toxoid-antitoxin and toxin-antitoxin mixtures are, respectively, 0.4 cc. (tube 5) and 0.1 cc. (tube 12) of 1/300 dilution of the standard antitoxin. Or, in other words, the excess 0.3 cc. of antitoxin contained in tube No. 5 has combined with the amount of toxoid present in the tube. The binding power of the latter may therefore be calculated as follows:

0.1 cc. of toxoid SR61 $\Bumpeq$ (0.4–0.1) cc. of 1/300 standard antitoxin

$\Bumpeq 3/10 \times 1/300 \times 50$ units of antitoxin

1 cc. of the above toxoid $\Bumpeq 3/10 \times 1/300 \times 50 \times 10$ units of antitoxin or

1/2 unit of antitoxin

Since one unit of antitoxin is equivalent to approximately 100 M. L. D. of toxin, 1 cc. of toxoid SR61 is equivalent to 100/2 M. L. D. of toxin in the binding power with antitoxin and this may be expressed as $Lb=50$.

It may be mentioned here that the M. L. D. of the toxin from which the SR61 toxoid was made was between 0.016 and 0.02 cc., i. e., a little above 50 M. L. D. per cc. Thus it seems that, like with diphtheria and tetanus toxins, there is very little loss of binding power of the perfringens type A toxin after being detoxified by formalin.

In the above protocol a 1/300 dilution of the standard antitoxin was chosen for the sake of convenience. The same results will, however, be obtained with any other suitable dilution within the range. With a 1/300 dilution 0.1L+ dose of toxin (equivalent approximately to 1/50 unit of antitoxin) always gives a positive opacity reaction with 0.125 cc.–0.1 cc. antitoxin equivalent to 1/50–1/60 unit of the standard. As a matter of fact, the test is highly sensitive and a very sharp end point may be obtained with closer dilutions. On this account great care should be taken in selecting toxoids which have been completely detoxified. It may be mentioned here that a toxoid found nontoxic in 1 cc. amounts when inoculated intraperitoneally in mice may still give a positive opacity reaction. For instance a residual toxin equal to 1/2 M. L. D. in the process of detoxifying will not kill a mouse but will give a 3+ reaction by the opacity test. Since we have proposed to use 0.1 cc. of the undiluted toxoid in the toxoid-antitoxin mixtures, toxoids which will produce no opacity reaction in at least 0.1 cc. doses should be selected by a preliminary test.

Protocol 2

Toxoid	Toxoid-antitoxin mixtures														Standard toxin-antitoxin mixtures				
	Amount of antitoxin in cc., 1·300 dilution																		
	0.85	0.8	0.75	0.7	0.65	0.6	0.55	0.5	0.45	0.4	0.35	3	2	1	0.25	0.2	0.15	0.1	0.05
19	0	0	0	0	0	0	0	0	0	+	++	+++	++++	++++	0	0	0	+	+++
24	0	0	0	0	0	0	0	0	0	±	+++	+++	++++	++++					
SR61	0	0	0	0	0	0	0	0	0	+	+++	++++	++++	++++					
1	0	+	++	+++	+++	+++	+++	+++	+++	+++	+++	++++	++++	++++					
2	±	++	+++	+++	+++	+++	+++	+++	+++	+++	+++	++++	++++	++++					
3	0	0	0	0	0	0	0	0	±	++	+++	++++	++++	++++					
17	0	0	0	0	0	0	±	+	++	+++	+++	++++	+++	+++					
SR621	0	0	0	0	0	0	+	++	+++	+++	+++	++++	++++	++++					
26	0	0	0	0	0	0	0	0	0	+	+++	++++	++++	++++					
51	0	+	++	+++	+++	+++	++++	+++	+++	+++	+++	+++	+++	+++	0	0	+	+++	+++
54	0	0	0	0	0	0	+	++	+++	+++	+++	++++	++++	++++					
12	0	0	0	0	0	0	0	0	0	0	±	++	+++	+++					
23	0	0	0	0	0	±	+++	+++	+++	+++	++++	+++	++++	++++					
224	0	0	0	0	0	0	0	0	+	+++	+++	+++	++++	++++					
25	0	+	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	++++	++++					

Fifteen samples of formol-toxoid prepared from different batches of *Cl. perfringens* type A toxin of variable potencies and giving no opacity reaction with 0.1 cc. of undiluted toxoid were tested against the standard antitoxin by the method described above. It may be mentioned here that it took as long as 40 to 60 days to detoxify completely some of the toxins using 0.3 percent formalin and incubating at 37° C. The results of the titration of the toxoids by the opacity reaction are given in protocol 2. The units of antitoxin neutralized by 1 cc. of each toxoid and the Lb value of the different samples calculated according to the method described above are shown in table 1.

TABLE 1.—*The M. L. D. of perfringens toxins and the Lb values of their corresponding toxoids*

Toxoid sample	M. L. D. of original toxin	pH after incubating with formalin	Units of antitoxin neutralized per cc. toxoid	Lb/cc.
19	.02 -.025	6.2	0.5	50
24	.02	6.2	.5	50
SR61	.016 -.02	6.2	.5	50
1	.01	6.5	1.08	108
2	.006	6.2	1.16	116
3	.008	5.4	.5	50
17	.01	6.1	.66	66
SR621	.01 -.02	6.2	.75	75
26	.025 -.05	6.2	.417	41.7
51	.006 -.0125	5.4	1.08	108
54	.0125-.025	6.2	.66	66
12	.025 -.05	6.2	.33	33
23	.0125-.025	5.4	.75	75
224	.006 -.0125	6.2	.5	50
25	.006 -.0125	6.2	1.08	108

In order to determine the correlation between the *in vitro* tests (Lb value) and *in vivo* tests, guinea pigs were immunized with 12 of the toxoids. Six guinea pigs were used for each toxoid and each pig was given 6 doses of 1 cc. distributed over a period of 2 weeks (only 5 doses were given with the last 7 toxoids). Two weeks after the last injection they were bled from the heart and the sera tested for antitoxin content, using the neutralization test in mice. The results are given in table 2.

TABLE 2.—*Correlation between the Lb values and the antigenic properties of perfringens toxoids*

Toxoid	Lb/cc.	Guinea pigs inoculated	Guinea pigs responding (percent)	Average units per guinea pig
1	108	6	(Pooled sera)	0.5 -.75
2	116	6	do	1.0 -1.5
3	50	6	do	.25-.5
17	66	6	do	.75
SR621	75	6	do	.5 -.75
26	41.7	5	20	.25-.5
51	108	5	40	.57
54	66	6	50	.25
12	33	5	20	.125
23	75	5	40	.25-.5
224	50	6	50	.25
25	108	6	66	.5 -.75

It will be seen from table 2 that there is a general correspondence between the Lb values and the antitoxin content of the sera of guinea pigs immunized with the toxoids. There are, however, two irregularities noted in the case of toxoids No. 1 and No. 51, both of which showed Lb values of 108. With toxoid No. 1 the pooled antisera is comparatively low in antitoxin content; with No. 51 toxoid the number of guinea pigs responding to the inoculation is low. Such discrepancies have also been noted with Lf values and the corresponding antisera in the case of diphtheria toxoids. The relationship between M. L. D. and Lb values as shown with toxoid SR61 in protocol 1 has been lost with two of the samples shown in table 1. This is probably due to the fact that some of the toxins from which the toxoids were made were allowed to stand for 10 days before the actual process of detoxifying with formalin was started. The pH may also be a factor.

DISCUSSION

The method described above for estimating the antitoxin binding power of *Cl. perfringens* type A toxin is simple and rapid. The results are consistent and reproducible, and the Lb values can be well compared with the Lf values of diphtheria toxoids.

The Lb values are obtained in terms of equivalents of antitoxin units. The latter may again be resolved into equivalents of M. L. D. of toxin, taking 100 M. L. D. equivalent to 1 unit of antitoxin. For the sake of convenience Lb values have been arbitrarily described here in terms of equivalents of M. L. D. instead of antitoxin units.

As is the case with diphtheria and tetanus toxoids there is only a slight loss of antigenicity due to detoxifying with formalin. But in order to show the relationship between toxicity and antigenicity, the toxins should be detoxified immediately after the M. L. D. of the toxin has been determined.

One other fact which should be noted is that the toxoids must be completely detoxified so that at least 0.1 cc. of the undiluted sample will not give a positive opacity reaction with inactivated normal human serum.

SUMMARY

The human serum opacity reaction proposed by Nagler for titrating perfringens toxins and antitoxins has been successfully applied for estimating the antitoxin binding power of *Cl. perfringens* type A toxoids.

ACKNOWLEDGMENTS

This work was first started in the Connaught Laboratories, Toronto, Canada, by one of us (S. C. S.) and we wish to express our indebtedness to Doctor H. Plummer of that laboratory for initiating this work.

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DISABLING MORBIDITY AMONG INDUSTRIAL WORKERS, FINAL QUARTER OF 1940, WITH AN INDEX OF THE PREVIOUS PUBLICATIONS OF THIS SERIES[1]

By WILLIAM M. GAFAFER, *Senior Statistician, United States Public Health Service*

The data presented in this paper are derived from periodic reports on sickness and nonindustrial injuries causing disability lasting more than one week among over 200,000 male members of 26 industrial sick benefit associations, group insurance plans, and company relief departments. The companies are located in Pennsylvania, Illinois, Massachusetts, Connecticut, New York, Ohio, Maine, South Dakota, New Jersey, and Canada.

The year 1940.—During the year 1940 there were recorded over 19,000 cases of sickness and nonindustrial injuries, representing, as shown in table 1, the slight increase in frequency of 7 percent as compared with the 5 years 1935–39. Excesses for 1940 are also shown for appendicitis, pneumonia, and bronchitis, the percentage excesses being, respectively, 21, 20, and 13.

Final quarter of 1940.—A comparison of the fourth-quarter frequencies for 1940 with the corresponding frequencies for 1939 reveals, principally, a 15 percent decrease in pneumonia and a 15 percent increase in appendicitis, the rate for appendicitis, as indicated in table 2, being the highest fourth-quarter rate for the 10-year period 1931–40, and over 20 percent greater than the mean (3.8) for the 10 fourth quarters.

[1] From the Division of Industrial Hygiene, National Institute of Health. The report for the third quarter appeared in the Public Health Reports, 55: 2397–2398 (Dec. 27, 1940).

TABLE 1.—*Frequency of disabling cases of sickness and nonindustrial injuries lasting 8 consecutive calendar days or longer among* MALE *employees in various industries, by cause, the fourth quarter of 1940 compared with the fourth quarter of 1939, and the full year of 1940 compared with the full years 1935–39, inclusive*[1]

Cause (numbers in parentheses are disease title numbers from the International List of Causes of Death, 1939)	Annual number of cases per 1,000 males				
	Fourth quarter		Full year		
	1940	1939	1940	1939	1935–39
Sickness and nonindustrial injuries[2]	83.8	80.7	96.4	89.5	89.9
Nonindustrial injuries (169–195)	11.8	10.6	11.7	10.3	11.1
Sickness	72.0	70.1	84.7	79.2	78.8
Respiratory diseases	30.1	28.7	37.8	34.3	33.1
Influenza and grippe (33)	12.6	10.8	17.4	16.5	15.3
Bronchitis, acute and chronic (106)	4.7	4.8	5.3	4.2	4.4
Diseases of the pharynx and tonsils (part of 115)	4.1	3.8	4.9	4.5	4.5
Pneumonia, all forms (107–109)	2.7	3.2	3.6	3.1	3.0
Tuberculosis of the respiratory system (13)	.6	.5	.7	.7	.8
Other respiratory diseases (104, 105, 110–114)	5.4	5.6	5.9	5.3	5.1
Nonrespiratory diseases	40.0	39.7	44.8	42.9	43.2
Digestive diseases	12.5	11.6	14.4	13.4	13.5
Diseases of the stomach, except cancer (117, 118)	3.4	3.3	3.9	3.5	3.8
Diarrhea and enteritis (120)	1.1	1.0	1.3	1.2	1.2
Appendicitis (121)	4.6	4.0	5.1	4.4	4.2
Hernia (part of 122)	1.2	1.1	1.5	1.4	1.6
Other digestive diseases (part of 115 and 122, 116, 123–129)	2.2	2.2	2.6	2.9	2.7
Nondigestive diseases	27.5	28.1	30.4	29.5	29.7
Diseases of the heart and arteries, and nephritis (90–99, 102, 130–132)	4.0	4.6	4.4	4.5	4.1
Other genitourinary diseases (133–138)	3.0	2.1	2.8	2.3	2.4
Neuralgia, neuritis, sciatica (part of 87)	2.0	2.4	2.4	2.2	2.2
Neurasthenia and the like (part of 84)	.9	1.0	1.1	1.0	1.0
Other diseases of the nervous system (80–83, 85, part of 84 and 87)	.9	.9	1.0	1.1	1.1
Rheumatism, acute and chronic (58, 59)	3.4	3.0	4.0	3.5	3.9
Diseases of the organs of locomotion, except diseases of the joints (part of 156)	2.9	2.7	2.9	2.6	2.9
Diseases of the skin (151–153)	2.4	2.6	2.7	2.7	2.9
Infectious and parasitic diseases[3] (1–12, 14–24, 26–29, 31, 32, 34–44)	1.2	1.5	1.8	2.1	2.4
All other diseases (45–57, 60–79, 88, 89, 100, 101, 103, 154, 155, part of 156, 157, 162)	6.8	7.3	7.3	7.5	6.8
Ill-defined and unknown causes (200)	1.9	1.7	2.1	2.0	2.5
Average number of males covered in the record	210,672	192,664	202,173	177,782	166,704
Number of organizations	26	26	26	26	-------

[1] In 1940 and 1939 the same organizations are included; the rates for the years 1935–39, however, are based on records from the same 26 organizations and some additional reporting organizations.
[2] Exclusive of disability from the venereal diseases and a few numerically unimportant causes of disability.
[3] Except influenza, respiratory tuberculosis and the venereal diseases.

Pneumonia, bronchitis, and appendicitis, 1931–40.—The behavior of the frequencies of pneumonia, bronchitis, and appendicitis for the years 1940 and 1939 is sufficiently striking to raise the question of the magnitude of the frequencies recorded for these causes in previous years. Table 2 gives the pertinent data for the 10 years 1931–40. It will be observed that all 3 causes show the highest frequencies for the year 1940. Close inspection of the annual frequencies reveals the trend corresponding to each cause to be increasing, bronchitis and appendicitis at approximately the same rate, and pneumonia slightly more rapidly. The 1940 frequencies for the 3 causes when related to the corresponding 10-year means yield the following percentage excesses: pneumonia, 44 percent; bronchitis, 29 percent; and appendicitis, 24 percent.

TABLE 2.—*Frequency of disabling cases of pneumonia and appendicitis for the fourth quarters of 1931–40 and of bronchitis, pneumonia, and appendicitis for the years 1931–40—cases lasting 8 consecutive calendar days or longer among* MALE *employees in various industries*

Year in which onset of disability occurred	Annual number of cases per 1,000 males				
	Fourth quarter		Year		
	Pneumonia, all forms	Appendicitis	Bronchitis, acute and chronic	Pneumonia, all forms	Appendicitis
1931–40 (mean)	2.4	3.8	4.1	2.5	4.1
1931	1.7	3.6	3.6	2.1	3.7
1932	2.6	3.6	3.6	2.0	3.4
1933	1.9	3.6	2.8	1.7	3.4
1934	2.1	3.8	3.2	2.0	4.1
1935	2.0	3.6	3.9	2.3	3.8
1936	2.2	3.6	4.9	2.6	4.2
1937	3.1	4.2	4.7	2.9	4.5
1938	2.9	3.5	4.3	2.3	4.0
1939	3.2	4.0	4.2	3.1	4.4
1940	2.7	4.6	5.3	3.6	5.1

Index of the reports.—To expedite the locating of a particular number of the Public Health Reports covering industrial sickness for a definite period of time, the following chronological index is presented:

Time period covered	Public Health Reports, date of issue	Time period covered	Public Health Reports, date of issue
First 6 months, 1920	Dec. 3, 1920	Third quarter, 1934	Jan. 25, 1935
First 9 months, 1920	Mar. 4, 1921	Fourth quarter, 1934	Apr. 26, 1935
1920	July 1, 1921	1934	Nov. 1, 1935
January 1920–June 1921	Jan. 6, 1922	First quarter, 1935	Aug. 23, 1935
1921, 1920	Dec. 29, 1922	Second quarter, 1935	Nov. 15, 1935
1923, 1920–23	Oct. 31, 1924	Third quarter, 1935	Jan. 31, 1936
1924, 1920–24	Jan. 22, 1926	Fourth quarter, 1935	May 22, 1936
1927, 1920–27	Feb. 22, 1929	1935	Jan. 1, 1937
1928, 1920–28	Jan. 17, 1930	First quarter, 1936	July 24, 1936
First quarter, 1929	Sept. 13, 1929	Second quarter 1936	Dec. 4, 1936
Second and third quarters, 1929	Feb. 14, 1930	Third quarter, 1936	Jan. 29, 1937
Fourth quarter, 1929	May 23, 1930	Fourth quarter, 1936	Apr. 30, 1937
First and second quarters, 1930	Oct. 24, 1930	1936	Sept. 17, 1937
Third and fourth quarters, 1930	Apr. 3, 1931	First quarter, 1937	Aug. 27, 1937
First quarter, 1931	July 31, 1931	Second quarter, 1937	Oct. 29, 1937
Second quarter, 1931	Oct. 16, 1931	Third quarter, 1937	Jan. 14, 1938
Third quarter, 1931	Jan. 15, 1932	Fourth quarter, 1937	Apr. 8, 1938
Fourth quarter, 1931; 1921–31	Apr. 29, 1932	First quarter, 1938; 1932–37	Sept. 2, 1938
First quarter, 1932	July 15, 1932	Second quarter, 1938	Oct. 28, 1938
Second quarter, 1932	Nov. 25, 1932	Third and fourth quarters, 1938	Apr. 28, 1939
Third quarter, 1932	Dec. 16, 1932	1921–38, by triennia	May 31, 1940
Fourth quarter, 1932	Mar. 31, 1933	First quarter, 1939	Aug. 25, 1939
1932	July 28, 1933	Second quarter, 1939	Oct. 20, 1939
First quarter, 1933	July 7, 1933	Third quarter, 1939	Jan. 5, 1940
Second quarter, 1933	Sept. 29, 1933	Fourth quarter, 1939	Apr. 12, 1940
Third quarter, 1933	Jan. 12, 1934	First quarter, 1940; 1939, 1938	Aug. 2, 1940
Fourth quarter, 1933	Mar. 30, 1934	Second quarter, 1940	Nov. 15, 1940
1933	May 25, 1934	Third quarter, 1940	Dec. 27, 1940
First quarter, 1934	June 29, 1934	Fourth quarter, 1940	Present report.
Second quarter, 1934	Oct. 19, 1934		

THE PREVALENCE OF DISABLING ILLNESS AMONG MALE AND FEMALE WORKERS AND HOUSEWIVES [1]

This bulletin, based upon data collected in the National Health Survey in 83 cities of the United States, is primarily concerned with comparisons between the rates [2] of illness found in three groups of adults: male workers, female workers, and housewives. The findings are summarized as follows:

1. Illness, as measured by the proportion of persons disabled on the day of the visit, was, for each age group, greater among female workers than it was among male workers. The rate for females, aged 15–64 years, exceeded that for males by 48 percent. The excess was about 50 percent in the age group 15–24, increased to a maximum in the age group 25–34, and decreased thereafter with advancing age.
2. When workers were divided into an employed and an unemployed group, similar relationships between the rates for male and female workers obtained. (Unemployed workers include those on work relief.)
3. When workers were grouped into four broad classes by occupation, the proportion disabled on the day of the visit was, in each class, greater among female than among male workers.
4. The business and professional, and the clerical classes (each sex), had rates of approximately the same magnitude; these rates were lower than those for the industrial and the "other" classes. (The business and professional class excludes farm owners and tenants; the industrial class is composed of skilled workers and foremen, semiskilled workers, and unskilled workers, excluding farm laborers and servants; "other" workers include servants, farmers and farm laborers, and those persons who had never before worked at a gainful occupation but who were seeking work.)

The excesses in the rates for industrial workers, aged 15–64, over the corresponding rates for nonmanual workers (business and professional and clerical) were 32 percent for males and 17 percent for females; the excesses in the rates for "other" workers over those for nonmanual workers were 36 percent for males and 44 percent for females.

When illnesses from puerperal and female genital causes and from occupational injuries were excluded, these percentage excesses among industrial and "other" workers were somewhat reduced. When, in addition, workers were separated into an employed and an unemployed group, these percentage excesses were still further reduced. Indeed, among employed men there was little variation between the

[1] Public Health Bulletin No. 260, same title as above, by David Hailman. U. S. Government Printing Office, 1941. Available from the Superintendent of Documents, Washington, D. C., at 10 cents per copy.

[2] Unless otherwise stated, the rates mentioned in this summary are based upon all causes, disease and accident, including puerperal and female genital causes and occupational injuries, and are adjusted to the age composition of workers and housewives enumerated in the National Health Survey.

rates for the four occupational classes (excluding occupational injuries). Among employed women there was little variation between the rates for the three occupational classes (excluding illnesses from puerperal and female genital causes and occupational injuries); only the rate for "other" workers was significantly in excess.

5. The rate for housewives, aged 15–64, was 59 percent in excess of the rate for female workers (47 percent when illnesses from puerperal and female genital causes were excluded). The excess was greatest in the early and late adult years. A great proportion of the excess among housewives 15–24 years of age was due to puerperal and female genital causes.

6. Excluding illnesses from puerperal and female genital causes and occupational injuries, the rate for female workers and housewives (combined) was about twice the rate for male workers for all ages (15–64) and for each age group.

7. While the illness rate for all causes for female workers, aged 15–64, was in excess of that for males (48 percent), there was great variation in this excess by the cause of the illness (diagnosis) and for some causes the rate for males was higher than that for females. The greater percentage excesses in the rates for female workers over those for males were shown for cancer and other tumors, nervous and mental diseases, tonsillitis and other throat diseases, colds and influenza, home accidents, sinusitis, gall-bladder and liver diseases, public accidents (excluding automobile), and appendicitis. The greater excesses in the rates for male workers over those for females were for hernia, ulcer of the stomach and duodenum, occupational accidents, hemorrhoids, and pneumonia.

8. Except in the case of accidents, the rate for housewives was higher than the rate for female workers for every diagnosis or group of diagnoses (26 groups). The higher percentage excesses were recorded for confinements, hernia, orthopedic impairments, varicose veins, female genital diseases, gall-bladder and liver diseases, tuberculosis, cardiovascular-renal diseases, ulcer of the stomach and duodenum, and asthma and hay fever. With the exception of confinements and female genital diseases, all of these large excesses were for chronic diseases.

9. The rate for female workers and housewives (combined) was higher than the rate for male workers for 21 of 26 diagnoses (or groups). The greater percentage excesses in the combined rate for females over that for males were recorded for cancer and other tumors, gall-bladder and liver diseases, nervous and mental diseases, "other chronic diseases," home accidents, tonsillitis, and cardiovascular-renal diseases. For only two diagnoses—hernia and ulcer of the stomach—were there considerable excesses in the rate for males over the combined rate for females.

10. With few exceptions, for each diagnosis the age curves for male workers, for female workers, and for housewives follow similar curves, although at different levels.

ADDITIONAL CONTRIBUTIONS TO OUTSIDE JOURNALS OF PERSONNEL OF THE PUBLIC HEALTH SERVICE[1]

The following articles by personnel of the Williams Malaria Research Laboratory, Columbia, S. C., were published in journals other than those of the U. S. Public Health Service during the year 1940.

Coatney, G. R., and West, E.[2]: Studies on *Haemoproteus sacharovi* of mourning doves and pigeons, with notes on *H. maccallumi*. Am. J. Hyg., **31** (Sec. C): 9–14 (1940).

Coatney, G. R.: Studies on *P. relictum* in the pigeon. I. Periodic phenomena of the asexual cycle. Am. J. Hyg., **31** (Sec. C): 15–18 (1940).

Young, M. D., Stubbs, T. H., and Coatney, G. R.: Studies in induced malaria in Negro paretics. I. Periodic phenomena of the asexual cycle. Am. J. Hyg., **31** (Sec. C): 51–59 (1940).

Young, M. D., Coatney, G. R., and Stubbs, T. H.: Studies in induced malaria in Negro paretics. II. The effect of modifying the external conditions. Am. J. Hyg., **32** (Sec. C): 63–70 (1940).

Young, M. D., and Coatney, G. R.: Reference citations and microfilm. Science, **92**: 429 (1940).

COURT DECISION ON PUBLIC HEALTH

Action by employee for lead poisoning.—(Georgia Court of Appeals, Division No. 2; *Middlebrooks* v. *Atlanta Metallic Casket Co.*, 11 S. E.2d 682; decided November 16, 1940.) An action was brought to recover damages on account of lead poisoning alleged to have been contracted by the plaintiff while in the employ of the defendant company. In his petition the plaintiff alleged, among other things, that the material from which caskets were made by the defendant was covered and coated with lead; that he operated a grinding disc to cut down the joints and corners of caskets under construction; that the machine threw into the air great quantities of lead and solder particles; that he did not know of the danger of contracting lead poisoning but that the defendant knew or should have known of such danger; and that the defendant did not warn him of the danger and negligently failed to furnish him with any mask, suction device, proper ventilation, or a safe place in which to work. There was presented to the court of appeals the question of the sufficiency of the petition and that court, in holding that the trial court erred in dismissing the plaintiff's petition, stated in its syllabus the principles applicable, as follows:

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[1] These references were received too late to be included in the listing published in the Public Health Reports of March 7, 1941, p. 454.

[2] Not employed by the Public Health Service.

1. A master must warn a servant of the conditions under which he is employed which are liable to engender disease, and must furnish suitable protection from such danger, provided that the master is in a position to have greater knowledge of the danger than the servant.

2. While the master is chargeable with knowledge of the fact that fumes or dust, given off by the various substances used in industrial processes, are poisonous to persons who inhale them and may engender in his servant lead poisoning, a disease, the servant, in the absence of a warning bv the master, will not be presumed to have knowledge thereof.

3. A servant in a metallic casket manufacturing business, the material from which the caskets are made being covered and coated with lead, will not be held as a matter of law to have known that the inhalation by one of fumes, dust, and particles of lead would likely engender or produce in the person inhaling them lead poisoning, an incurable disease, so as to be charged with assumption of the risk.

DEATHS DURING WEEK ENDED MARCH 29, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 29, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,814	9,081
Average for 3 prior years	8,954	
Total deaths, first 13 weeks of year	123,710	123,083
Deaths under 1 year of age	541	514
Average for 3 prior years	545	
Deaths under 1 year of age, first 13 weeks of year	7,091	6,712
Data from industrial insurance companies:		
Policies in force	64,588,630	65,901,954
Number of death claims	12,619	13,732
Death claims per 1,000 policies in force, annual rate	10.2	10.9
Death claims per 1,000 policies, first 13 weeks of year, annual rate	10.8	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 5, 1941

Summary

For the current week 56,338 cases of measles were reported by the State health authorities, as compared with 55,805 cases for the preceding week and with 47,421 for the next earlier week. To date (first 14 weeks), a total of 381,925 cases has been reported this year, as compared with 451,906 cases for the corresponding period in 1938, the year of highest measles incidence in the 5 years 1936–40.

The highest current incidence, as shown by case rates, is recorded for the East North Central and Middle Atlantic States, both of which areas, however, reported decreases from the preceding week. Slight increases were reported from all other geographic areas except the Mountain States, but the indications are that the peak for measles for the present season has about been reached.

No significant changes were noted in the incidence of the other 8 communicable diseases reported weekly by the State health officers. The number of reported cases of influenza dropped from 7,048 for the preceding week to 4,119, but it may be that the figures for the earlier week included some delayed reports. Only 33 cases of smallpox were reported, of which 15 occurred in Wisconsin. Of 21 cases of poliomyelitis, 5 were reported in Florida, and of 40 cases of endemic typhus fever, 18 occurred in Texas. Five cases of Rocky Mountain spotted fever were reported, 2 each in Montana and Wyoming and 1 in South Dakota. Three cases of tularemia were reported in North Carolina.

The death rate for the current week for 93 major cities in the United States was 12.0 per 1,000 population, as compared with 12.3 for the preceding week and with a 3-year (1938–40) average of 12.4 for the corresponding week (88 cities).

Telegraphic morbidity reports from State health officers for the week ended April 5, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Apr. 5, 1941	Apr. 6, 1940		Apr. 5, 1941	Apr. 6, 1940		Apr. 5, 1941	Apr. 6, 1940		Apr. 5, 1941	Apr. 6, 1940	
NEW ENG.												
Maine	1	1	1	4	------	6	151	668	195	0	0	0
New Hampshire	1	1	0	------	------	------	86	41	35	0	0	0
Vermont	1	0	0	------	------	------	57	8	45	0	0	0
Massachusetts	9	0	2	------	------	------	759	472	736	3	1	1
Rhode Island	0	0	0	------	------	------	7	203	48	0	0	0
Connecticut	9	0	1	5	8	10	209	83	83	1	1	2
MID. ATL.												
New York [1]	18	18	31	[2] 24	[2] 11	[2] 17	8,459	668	1,563	6	1	3
New Jersey	7	1	9	25	6	13	3,326	462	462	1	1	1
Pennsylvania	11	24	31	------	------	------	5,310	264	661	7	7	7
E. NO. CEN.												
Ohio	7	12	13	35	67	20	9,278	25	270	1	0	2
Indiana	17	6	11	15	16	69	806	59	59	1	5	5
Illinois	25	22	27	16	22	61	3,660	63	63	2	0	2
Michigan [3]	9	3	11	5	22	12	4,727	388	388	3	0	1
Wisconsin	0	1	1	103	175	69	1,649	469	469	0	1	1
W. NO. CEN.												
Minnesota	2	1	4	2	2	1	6	160	227	0	0	1
Iowa	9	2	2	52	4	5	180	135	135	0	0	0
Missouri	5	9	23	4	4	21	299	29	29	1	0	1
North Dakota	3	0	0	3	12	24	33	5	5	0	0	0
South Dakota [4] [5]	1	0	0	1	5	------	16	3	2	0	0	0
Nebraska	3	5	1	1	------	------	42	13	108	0	0	0
Kansas	3	5	5	7	19	19	1,169	582	43	1	1	1
SO. ATL.												
Delaware	0	1	1	------	------	------	319	3	21	0	0	0
Maryland [3]	1	0	6	44	25	16	344	5	292	5	0	0
Dist. of Col.	0	1	4	3	------	1	328	2	45	1	0	0
Virginia	10	16	13	388	292	292	2,619	82	248	5	1	3
West Virginia [3]	9	9	8	20	171	171	612	7	21	3	1	3
North Carolina [1]	15	17	17	22	33	34	1,680	163	204	1	0	2
South Carolina	8	9	2	415	552	528	647	16	32	4	0	0
Georgia [1]	5	8	8	164	168	344	1,207	150	150	1	0	1
Florida [1]	6	5	7	178	6	6	1,136	124	124	1	0	1
E. SO. CEN.												
Kentucky	9	4	8	84	13	21	1,808	146	146	0	1	6
Tennessee	10	1	5	96	140	141	706	84	83	2	1	5
Alabama [1]	4	5	10	124	172	648	698	113	113	3	1	7
Mississippi [3]	0	8	4	------	------	------	------	------	------	6	2	1
W. SO. CEN.												
Arkansas	4	3	3	276	134	134	332	10	10	3	3	1
Louisiana [1]	2	6	7	11	45	45	94	34	34	1	0	1
Oklahoma	5	4	8	175	68	115	46	17	55	1	1	1
Texas [1]	34	24	30	1,173	882	882	1,825	890	436	2	6	3
MOUNTAIN												
Montana [5]	4	2	0	9	------	11	17	16	20	0	0	0
Idaho	1	1	1	------	2	4	20	35	15	0	0	0
Wyoming [4]	1	1	1	------	1	------	57	43	43	0	0	0
Colorado	9	12	10	35	34	------	397	31	31	0	0	0
New Mexico	2	0	0	------	------	4	197	50	54	0	0	0
Arizona [1]	2	0	1	146	122	92	98	104	104	1	0	1
Utah [3]	0	0	0	69	4	3	13	498	102	0	0	0
Nevada	0	------	------	------	------	------	38	------	------	0	------	------
PACIFIC												
Washington	6	1	2	11	2	1	48	1,014	362	1	2	1
Oregon	0	13	2	16	22	42	404	592	54	2	0	1
California	21	9	26	349	151	151	419	352	616	0	2	2
Total	309	271	395	4,119	3,412	3,931	56,338	9,381	12,280	70	39	65
14 weeks [4]	4,117	5,213	7,218	573,312	152,441	123,386	381,925	86,250	117,137	694	559	1,226

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 5, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Apr. 5, 1941	Apr. 6, 1940		Apr. 5, 1941	Apr. 6, 1940		Apr. 5, 1941	Apr. 6, 1940		Apr. 5, 1941	Apr. 6, 1940	
NEW ENG.												
Maine	1	0	0	10	11	15	0	0	0	0	0	3
New Hampshire	0	0	0	3	0	9	0	0	0	0	0	0
Vermont	0	0	0	19	9	12	0	0	0	0	0	0
Massachusetts	0	0	0	220	185	274	0	0	0	1	0	1
Rhode Island	0	0	0	7	22	25	0	0	0	0	0	0
Connecticut	0	0	0	162	117	117	0	0	0	2	3	1
MID. ATL.												
New York [1]	0	1	2	610	920	920	0	0	0	4	6	6
New Jersey	0	0	0	338	371	174	0	0	0	3	0	2
Pennsylvania	1	1	0	394	406	598	0	0	0	1	7	7
E. NO. CEN.												
Ohio	2	1	0	411	363	361	0	1	3	2	4	4
Indiana	0	0	0	161	206	206	2	2	9	1	2	0
Illinois	0	2	1	466	952	763	1	5	8	1	1	3
Michigan [3]	1	0	0	301	365	413	0	0	9	3	2	3
Wisconsin	3	1	0	154	81	241	15	1	4	0	1	1
W. NO. CEN.												
Minnesota	0	0	0	68	74	144	2	2	5	0	0	0
Iowa	0	0	0	42	35	221	1	11	40	1	2	1
Missouri	0	0	0	120	111	115	1	0	23	0	1	2
North Dakota	0	0	0	4	15	17	0	1	3	0	1	1
South Dakota [4 5]	0	0	0	27	17	18	1	2	6	0	1	0
Nebraska	0	0	0	38	13	34	0	3	6	0	0	0
Kansas	0	1	0	37	61	142	1	0	18	1	1	1
SO. ATL.												
Delaware	0	0	0	7	8	5	0	0	0	0	0	0
Maryland [3]	0	0	0	38	50	50	0	0	0	1	0	3
Dist. of Col.	0	1	0	14	17	17	0	0	0	0	1	1
Virginia	1	1	0	58	71	49	0	0	0	2	4	4
West Virginia [3]	0	1	1	58	53	53	0	0	0	2	2	2
North Carolina [1]	0	0	0	34	31	32	0	0	0	2	2	2
South Carolina	0	0	0	3	6	6	0	2	0	10	0	0
Georgia [1]	0	0	0	19	10	10	0	0	0	2	3	1
Florida [1]	5	1	0	2	9	8	0	0	0	10	1	3
E. SO. CEN.												
Kentucky	0	0	0	146	89	69	0	0	1	1	6	4
Tennessee	1	1	0	71	91	35	0	1	0	0	3	3
Alabama [1]	0	1	0	20	12	9	0	0	0	0	2	2
Mississippi [3]	1	0	1	9	6	6	0	0	0	2	2	1
W. SO. CEN.												
Arkansas	0	1	0	12	6	10	1	1	1	1	1	3
Louisiana [1]	0	0	0	8	12	10	0	0	0	2	2	9
Oklahoma	0	0	0	21	16	22	3	3	3	1	1	1
Texas [1]	0	4	0	71	49	60	3	3	5	5	7	9
MOUNTAIN												
Nontana [3]	0	0	0	37	22	17	0	0	6	0	1	1
Idaho	0	1	0	5	14	17	0	0	4	0	0	0
Wyoming [5]	0	0	0	29	4	17	0	0	3	1	0	0
Colorado	0	0	0	40	35	35	0	4	4	3	2	0
New Mexico	0	0	0	6	22	19	0	1	0	1	2	2
Arizona [1]	1	0	0	5	7	11	0	0	0	0	0	1
Utah [3]	0	0	0	12	14	30	0	1	1	0	0	0
Nevada	0	-----	-----	0	-----	-----	0	-----	-----	2	-----	-----
PACIFIC												
Washington	0	0	0	17	57	37	2	3	5	1	2	0
Oregon	1	0	0	5	20	43	0	0	6	2	0	1
California	1	4	1	124	123	196	0	2	9	2	4	2
Total	21	23	17	4,463	5,188	5,703	33	49	213	73	78	115
14 weeks [4]	372	377	293	51,670	66,711	85,084	638	1,003	4,333	1,061	1,080	1,514

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 5, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Whooping cough — Week ended— Apr. 5, 1941	Whooping cough — Week ended— Apr. 6, 1940
NEW ENG.		
Maine	13	61
New Hampshire	0	21
Vermont	14	31
Massachusetts	222	132
Rhode Island	26	8
Connecticut	72	26
MID. ATL.		
New York [1]	335	401
New Jersey	94	116
Pennsylvania	375	270
E. NO. CEN.		
Ohio	284	180
Indiana	21	21
Illinois	81	148
Michigan [2]	426	114
Wisconsin	131	82
W. NO. CEN.		
Minnesota	102	30
Iowa	40	11
Missouri	44	33
North Dakota	16	0
South Dakota [4] [5]	27	5
Nebraska	23	1
Kansas	170	32
SO. ATL.		
Delaware	6	15
Maryland [3]	93	216
Dist. of Col	18	14
Virginia	76	58
West Virginia [3]	134	124
North Carolina [1]	263	106
South Carolina	111	31
SO. ATL.—CON.		
Georgia [1]	22	42
Florida [1]	19	16
E. SO. CEN.		
Kentucky	74	115
Tennessee	66	43
Alabama [1]	23	23
Mississippi [3]		
W. SO. CEN.		
Arkansas	43	3
Louisiana [1]	3	5
Oklahoma	59	10
Texas [1]	322	284
MOUNTAIN		
Montana [5]	24	6
Idaho	10	8
Wyoming [5]	1	3
Colorado	99	2
New Mexico	26	70
Arizona [1]	38	30
Utah [3]	60	109
Nevada	8	
PACIFIC		
Washington	115	64
Oregon	11	29
California	485	372
Total	4,725	3,521
14 weeks [4]	60,638	41,351

[1] Typhus fever, week ended April 5, 1941, 40 cases, as follows: New York, 1; North Carolina, 3, Georgia, 10, Florida, 3; Alabama, 3; Louisiana, 1; Texas, 18; Arizona, 1.
[2] New York City only.
[3] Period ended earlier than Saturday.
[4] Delayed report for South Dakota, week ended Mar. 29, 1941: Diphtheria, 1; influenza, 2; measles, 13; scarlet fever, 10; whooping cough, 13.
[5] Rocky Mountain spotted fever, week ended Apr. 5, 1941, 5 cases, as follows: South Dakota, 1; Montana, 2; Wyoming, 2.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 22, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	125	525	110	5,912	819	2,212	26	386	21	1,182	--------
Current week [1]	64	318	46	18,361	512	1,426	5	357	16	1,119	--------
Maine: Portland	0	------	0	1	2	0	0	0	0	13	22
New Hampshire:											
Concord	0	------	0	1	0	1	0	1	0	0	12
Nashua	0	------	0	0	0	0	0	0	0	9	6
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	7
Massachusetts:											
Boston	0	------	1	238	19	55	0	9	0	42	254
Fall River	1	------	0	0	0	11	0	2	0	2	34
Springfield	0	------	0	4	0	15	0	0	0	2	36
Worcester	0	------	0	65	7	5	0	1	0	1	54
Rhode Island:											
Pawtucket	0	------	0	0	1	1	0	0	1	0	10
Providence	0	------	0	2	3	5	0	2	0	11	71
Connecticut:											
Bridgeport	0	------	0	3	0	5	0	0	0	1	22
Hartford	0	------	0	0	1	1	0	0	0	3	22
New Haven	0	------	0	0	0	23	0	1	0	8	32
New York:											
Buffalo	0	------	1	48	8	35	0	5	0	7	147
New York	17	32	5	6,328	112	272	0	72	0	74	1,648
Rochester	0	------	0	25	0	2	0	0	0	13	49
Syracuse	0	------	0	0	5	5	0	2	0	10	42
New Jersey:											
Camden	0	1	0	22	0	10	0	0	0	0	19
Newark	0	9	1	321	3	49	0	6	0	12	81
Trenton	0	2	1	0	4	50	0	4	0	0	60
Pennsylvania:											
Philadelphia	7	2	2	1,628	35	92	0	15	0	49	521
Pittsburgh	1	3	0	170	16	7	0	6	0	51	153
Reading	0	------	0	198	1	3	0	1	0	6	29
Scranton	0	------	------	1	------	1	0	------	0	0	------
Ohio:											
Cincinnati	1	2	0	123	4	13	2	8	0	3	121
Cleveland	0	14	0	2,803	10	30	0	11	0	51	189
Columbus	0	1	1	150	6	13	0	0	1	43	93
Toledo	0	------	0	53	4	6	0	2	0	14	72
Indiana:											
Anderson	0	------	0	1	0	2	0	1	0	0	6
Fort Wayne	0	------	0	60	4	0	0	1	0	0	28
Indianapolis	2	------	0	149	15	19	0	3	0	8	121
Muncie	0	------	0	36	3	13	0	0	0	0	15
South Bend	0	------	0	32	0	5	0	0	0	0	21
Terre Haute	0	------	1	0	1	0	0	0	0	0	12
Illinois:											
Alton	0	1	0	0	1	2	0	0	0	0	15
Chicago	5	6	2	1,968	32	208	0	22	0	30	810
Elgin	1	------	0	362	0	0	0	0	0	0	11
Moline	1	13	0	14	0	0	0	0	0	3	11
Springfield	0	------	2	3	3	2	0	2	0	3	22
Michigan:											
Detroit	5	10	2	1,210	18	135	0	13	1	124	310
Flint	0	------	0	110	5	3	0	0	0	5	36
Grand Rapids	0	1	0	449	1	9	0	1	0	8	41
Wisconsin:											
Kenosha	0	------	0	132	6	0	0	0	0	0	11
Madison	0	------	0	38	0	2	0	0	0	2	11
Milwaukee	0	1	1	138	10	31	0	2	0	31	106
Racine	0	------	0	14	0	4	0	1	0	5	12
Superior	0	------	0	1	0	2	0	0	0	0	7
Minnesota:											
Duluth	0	------	2	0	0	0	0	0	0	6	22
Minneapolis	0	------	0	5	2	18	0	1	0	37	70
St. Paul	0	------	0	1	8	5	0	2	1	12	68

[1] Figures for Barre estimated; report not received.

City reports for week ended March 22, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0			5		0	0		0	0	
Davenport	0			0		5	0		0	0	
Des Moines	1			4		2	0		0	3	36
Sioux City	1			1		2	0		0	9	
Waterloo	0			33		1	0		0	7	
Missouri:											
Kansas City	0	1	1	18	9	11	1	1	1	20	109
St. Joseph	0		0	6	4	0	0	0	0	0	13
St. Louis	0	2	1	129	8	64	0	7	0	21	204
North Dakota:											
Fargo	0		0	0	1	1	0	0	0	10	3
Grand Forks	0			0		0	0		0	0	
Minot	1			2		0	0		0	2	6
South Dakota:											
Aberdeen	0			0		0	0		0	0	
Sioux Falls	0			0		1	0		0	0	7
Nebraska:											
Lincoln	0			2		7	0		0	1	
Omaha	0		0	1	2	2	0	3	0	2	61
Kansas:											
Lawrence	0		0	42	0	0	0	0	0	1	5
Topeka	0		0	188	1	4	0	0	0	12	16
Wichita	0		0	1	2	1	0	1	0	15	28
Delaware:											
Wilmington	0		0	170	5	3	0	2	0	0	29
Maryland:											
Baltimore	2	6	2	54	20	28	0	15	0	54	252
Cumberland	0		0	0	1	1	0	0	0	3	14
Frederick	0		0	0	0	0	0	0	0	0	5
Dist. of Col.:											
Washington	2	2	0	287	9	23	0	12	1	7	185
Virginia:											
Lynchburg	0		0	10	1	0	0	0	0	0	14
Norfolk	1	65	0	201	4	4	0	0	0	7	26
Richmond	0		1	51	5	0	0	5	0	2	50
Roanoke	0		0	153	0	2	0	0	0	2	24
West Virginia:											
Charleston	0	2	0	24	2	0	0	1	0	0	23
Huntington	0			25	0	0	0	0	0	3	
Wheeling	0		0	5	5	2	0	1	0	4	27
North Carolina:											
Gastonia	0		0	19	0	1	0	0	0	4	
Raleigh	0		0	275	0	0	0	3	0	9	19
Wilmington	2		0	2	4	0	0	0	0	1	24
Winston-Salem	1		2	11	0	0	0	0	0	8	17
South Carolina:											
Charleston	0	35	1	64	6	1	0	0	3	1	27
Florence	0	4	0	2	1	0	0	0	0	0	6
Greenville	0		0	49	0	3	0	0	0	7	3
Georgia:											
Atlanta	0	11	0	24	5	0	1	4	0	3	100
Brunswick	0		0	5	1	0	0	0	0	0	6
Savannah	0	17	2	15	4	2	0	2	1	0	26
Florida:											
Miami	0	7	1	14	0	1	0	2	1	2	47
Tampa	0	1	1	0	0	0	0	1	0	3	41
Kentucky:											
Ashland	0		0	1	2	1	0	0	0	0	7
Covington	0	1	0	21	1	2	0	1	0	0	15
Lexington	0		0	3	1	0	0	0	0	1	17
Louisville	1	12	0	399	13	0	0	3	0	10	83
Tennessee:											
Knoxville	1		0	56	1	6	0	3	0	4	33
Memphis	0	5	1	111	2	4	0	3	1	13	76
Nashville	0		1	56	4	10	0	2	0	3	65
Alabama:											
Birmingham	1	22	0	70	4	2	0	5	2	8	73
Mobile	0	9	1	14	4	0	0	0	0	11	23
Montgomery	1	2		20		0	0		0	1	
Arkansas:											
Fort Smith	0			11		0	0		0	0	
Little Rock	0	11	0	17	8	1	0	0	0	3	8
Louisiana:											
New Orleans	1	4	2	9	10	4	0	19	0	11	149
Shreveport	0		0	0	1	2	1	1	0	0	23

City reports for week ended March 22, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Oklahoma:											
Oklahoma City	0	2	1	0	3	7	0	0	0	0	39
Tulsa	0	------	0	42	1	4	0	1	0	5	23
Texas:											
Dallas	4	2	2	13	7	12	0	1	1	1	76
Fort Worth	0	------	1	88	3	2	0	5	0	0	51
Galveston	0	------	0	4	1	0	0	1	0	0	18
Houston	1	3	1	1	4	2	0	5	1	0	80
San Antonio	0	4	1	0	7	0	0	9	0	0	74
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	7
Great Falls	0	------	0	1	4	3	0	0	0	0	12
Helena	0	------	0	0	0	2	0	0	0	0	3
Missoula	0	------	0	0	1	1	0	0	0	0	11
Idaho:											
Boise	0	------	0	6	0	1	0	0	0	0	11
Colorado:											
Colorado Springs	0	------	0	0	0	6	0	4	0	1	11
Denver	4	12	1	145	5	7	0	5	0	56	82
Pueblo	0	------	0	2	0	0	0	0	0	10	8
New Mexico:											
Albuquerque	0	------	0	35	0	0	0	3	0	0	10
Utah:											
Salt Lake City	4	------	0	5	1	3	0	0	0	18	19
Washington:											
Seattle	0	------	1	0	3	2	0	8	0	22	129
Spokane	0	------	0	3	0	1	0	0	1	0	24
Tacoma	0	------	1	8	1	0	0	0	0	8	40
Oregon:											
Portland	1	------	0	14	1	1	0	0	0	2	78
Salem	0	------	0	2	0	0	0	0	0	0	-------
California:											
Los Angeles	0	20	0	52	8	59	0	22	0	47	340
Sacramento	2	------	0	3	4	4	0	0	1	14	27
San Francisco	1	65	1	6	3	9	0	12	0	64	173

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases	State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:				West Virginia:			
Boston	2	2	0	Wheeling	0	1	0
New York:				Florida:			
New York	1	1	0	Miami	0	0	2
Indiana:				Tennessee:			
Terre Haute	1	1	0	Memphis	0	1	0
Illinois:				Alabama:			
Chicago	3	1	0	Birmingham	0	0	1
Minnesota:				Louisiana:			
St. Paul	0	0	1	Shreveport	0	1	0
Maryland:				California:			
Baltimore	1	1	0	Los Angeles	2	0	1
District of Columbia:				San Francisco	1	0	0
Washington	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: Topeka, 2. Deaths: New York, 1; Topeka, 2.
Pellagra.—Cases: Atlanta, 1; Savannah, 1; New Orleans, 1; San Antonio, 1.
Typhus fever.—Cases: New York, 2; Savannah, 2; Miami, 1; Mobile, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on March 10, 1941, at Kalopa Homesteads, Hamakua District, Island of Hawaii, has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 1, 1941.—During the week ended March 1, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	7	2	13	14	2		1	5	45
Chickenpox		10	1	133	413	20	17	13	86	693
Diphtheria		14	2	29		2	2			49
Dysentery				5						5
Influenza		77			18	5			89	180
Measles	1	239	311	195	910	148	88	276	1, 120	3, 288
Mumps				221	212	33	11	20	39	536
Pneumonia		14			16	2		1	19	52
Scarlet fever		22	10	104	179	9	1	21	29	375
Tuberculosis		29	8	81	31	21		1		171
Typhoid and paratyphoid fever		1	1	10	2	1			1	16
Whooping cough				99	238	10	1	1	8	357

CUBA

Provinces—Notifiable diseases—4 weeks ended March 1, 1941.—During the 4 weeks ended March 1, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		2	9		12	24
Diphtheria		28		3	1	7	39
Hookworm disease	1	23					24
Leprosy					1	2	3
Malaria	18	1		27	2	492	540
Measles	61		2	8	8		79
Poliomyelitis			1			1	2
Scarlet fever		1					1
Tetanus, infantile						2	2
Tuberculosis	21	70	19	42	10	38	200
Typhoid fever	20	70	3	19	7	28	147
Whooping cough		2					2
Yaws						1	1

[1] Includes the city of Habana.

JAMAICA

Communicable diseases—4 weeks ended March 15, 1941.—During the 4 weeks ended March 15, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	1	14	Puerperal fever		1
Diphtheria	3	2	Scarlet fever		1
Dysentery	10	6	Tuberculosis	8	55
Erysipelas		2	Typhoid fever	11	59
Leprosy		7			

SWITZERLAND

Notifiable diseases—December 1940.—During the month of December 1940, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	31	Poliomyelitis	11
Chickenpox	164	Scarlet fever	377
Diphtheria and croup	73	Trachoma	1
German measles	7	Tuberculosis	231
Influenza	59	Typhoid fever	3
Measles	297	Undulant fever	5
Mumps	81	Whooping cough	133
Paratyphoid fever	5		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of March 28, 1941, pages 674–678. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Peru.—Plague has been reported in Peru, by Departments, as follows: January 1–31, 1941, Lambayeque, 1 case, 1 death; Libertad, 4 cases, 2 deaths; Lima, 2 cases, 2 deaths; February 1–28, 1941, Libertad, 1 case. Plague-infected rats were also found in Lambayeque Department.

Yellow Fever

French Equatorial Africa.—On March 12, 1941, 1 fatal case of yellow fever was reported in the Gabon estuary, Donguila Department, French Equatorial Africa.

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Public Health Reports

VOLUME 56 APRIL 18, 1941 NUMBER 16

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PREVALENCE OF DISEASE

Public Health Reports

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MECHANICAL AIDS FOR STREAM SURVEYS

By C. T. Carnahan, *Associate Public Health Engineer, United States Public Health Service*

Man's material gains and accomplishments are largely due to his ability in devising, adapting, and using tools as aids to help him in going about his work. Such tools have ranged from the first stone, crudely used as a hammer or a weapon, to the modern complex precision machine tools and marvelously delicate scientific apparatus now in everyday use. No matter how simple, how complex, or how delicate the device may be, it is merely a tool which, when properly applied, aids in the accomplishment of a task.

As in all other fields of human endeavor, stream surveys require the devising, adoption, and use of tools in order to obtain part of the data from which the final conclusions are drawn. As is usually the case with all finished products, the attention of the beholder is upon the end result and there is little or no thought given to the role played by the devices, without the aid of which, perhaps, some of the data might not have been obtained. It is the purpose of this paper to describe some of the devices used by the Public Health Service in connection with the Ohio River Pollution Survey and with other stream surveys of the United States Public Health Service, and to show their place in the accumulation of laboratory data.

WATER SAMPLING DEVICES

An important part of a stream survey is the analysis of a considerable number of samples from various points along the stream under study. The analysis of these stream samples, supported by physical data, is the basis from which the conclusions as to the condition of the stream are drawn. It is obvious, then, that these samples must be collected with the utmost care and should be representative of the waters at the place and time of collection. The usual analyses are physical, chemical, and biological, including bacteriological tests.

For the collection of samples in small, shallow streams, no special apparatus may be involved, the samples being taken directly into the sampling bottles and reliance being placed on the technique of collection, the details of which are not here described. In the case

of samples for dissolved oxygen determination, the simplest sampling device may consist merely of a two-holed stopper inserted into the neck of the collection bottle and fitted with two tubes, one extending to the bottom of the bottle and the other extending a short distance above the stopper and acting as an air vent. A further extension of this device is so constructed that several samples may be taken at the same time. Illustrated is one of these samplers as developed for use in the Ohio River Pollution Survey (fig. 1). It consists of a central pole at the bottom of which is arranged a holder for three bottles, one bacteriological sample bottle and two dissolved oxygen sample bottles. A sliding wire rod with a clip at the end is attached to one side of the central pole and arranged to permit raising the stopper of the bacteriological sample bottle slightly after the sampler is in place. This allows the bottle to be filled and permits the reinsertion of the stopper immediately after the bottle has been filled. The dissolved oxygen samples are collected by inserting stoppers equipped as previously described with water inlet and air exhaust tubes into the necks of the dissolved oxygen sample bottles and allowing them to fill completely upon submergence.

In the deeper and larger streams, sampling becomes more difficult. The streams become too deep and wide for wading and for the use of shallow depth samplers. For these conditions sampling devices have been made which are capable of operation from a boat or from a bridge and which are arranged to collect several samples simultaneously. Essentially, this type of sampler consists of a suitably weighted metal can with a tight fitting cover, an inside rack for holding the sample bottles, water inlet tubes for the dissolved oxygen sample bottles, an arrangement for the insertion of a sterilized water inlet tube to the bacteriological sample bottle, and an air outlet from the can which may or may not be valved to permit the collection of samples at given depths. The sampling can usually has a capacity such that the water in the dissolved oxygen sampling bottles is displaced several times before the can becomes filled to the level of the air vent. The air vent level and bottle holder are adjusted so that the filling stops when the water level in the can reaches the shoulder of the bacteriological bottle, while just completely submerging the dissolved oxygen bottles. This arrangement protects the bacteriological sample from contamination by the overflow from the dissolved oxygen bottles and from the sampling can, and at the same time assures the complete filling of the dissolved oxygen sampling bottles. Details of this type of sampler are shown in figures 2 and 3. Figure 2 is the sampler used on the Illinois River study (1921–22) and figure 3 shows the type used on the Ohio River Pollution Survey in 1939–40.

This type of sampler is used in all streams where there is sufficient depth of water to allow complete submergence of the can and water

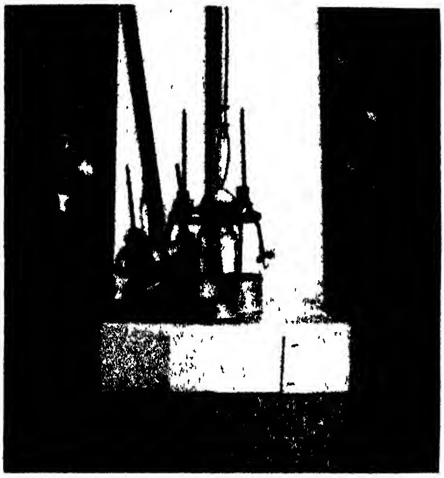

FIGURE 1.—Shallow depth sampler (sampling stick) ready for use.

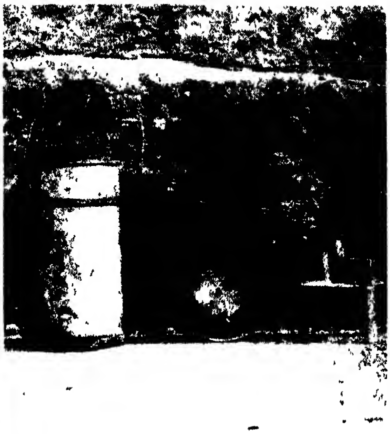

FIGURE 2.—Illinois River Survey sampler

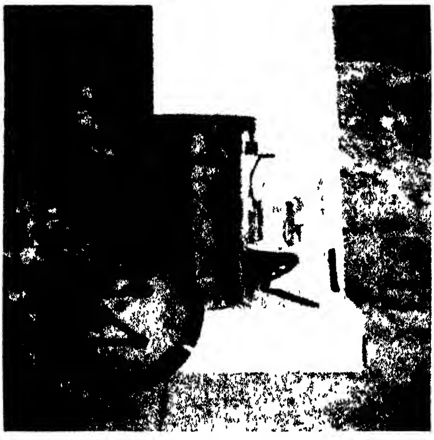

FIGURE 3.—Ohio River Pollution Survey sampling can.

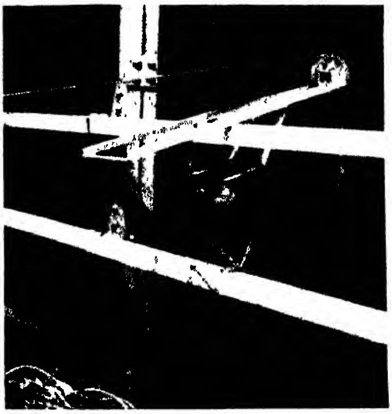

FIGURE 4.—Bridge hoist for raising sampling cans.

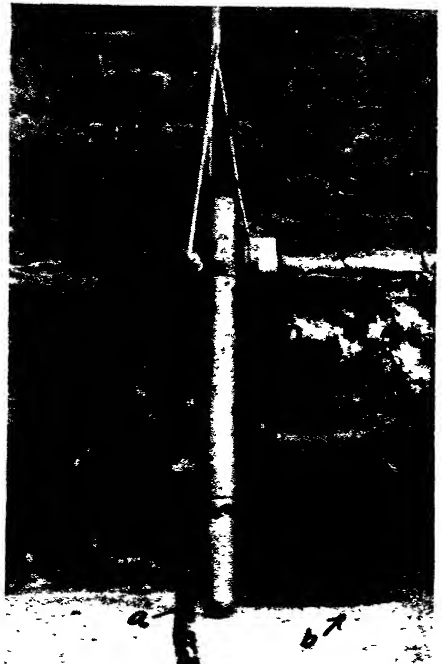

FIGURE 5.—Bottom sampler. (a) Steel tube; (b) glass cylinder for sample; (c) free-acting flap valve; (d) lead casing for added weight; (e) lifting rope.

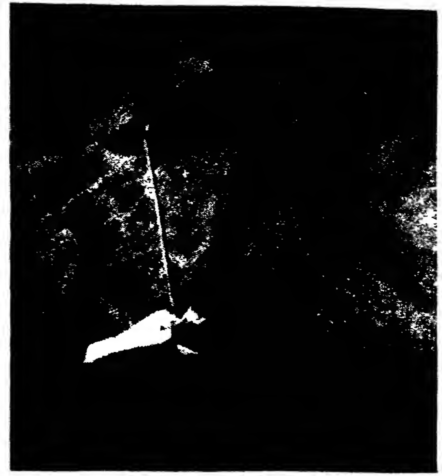

FIGURE 6.—Purdy mud scoop, showing method of action.

FIGURE 7.—Ohio River Pollution Survey bottom sediment sampler suspended from derrick and ready to descend.

inlet tube. A possible improvement, particularly where the sampling can has an air release valve permitting sampling at various depths, would be the addition of a vane or rudder to keep the can from twisting in the current and fouling the air valve release line; or, better, the suspension of the sampler by means of a spring arrangement which would permit the air valve to be opened by means of a sharp jerk on the lifting line when the desired depth has been reached. This would obviate the need of more than one line to the sampling can.

In those instances where bridges, used as sampling points, are high above the water elevation, as is the case with most navigable streams, it is difficult to hoist the filled sampler hand over hand for a vertical distance which may be 80 feet or more. Portable sample hoisting equipment has been devised for such cases. This hoist, shown in figure 4, consists of an A-frame designed to permit its attachment to the bridge railing and is held in place by light chains fore and aft. The rope to the sampler is passed through the pulley on the overhanging end.

MUD SAMPLING DEVICES

The examination and analysis of bottom sediment samples is of much interest and value in connection with stream surveys. The present methods of obtaining representative samples of bottom materials leave much to be desired. It is not the province of this article to deal with the actual difficulties and problems of collecting representative bottom deposit samples, but only to describe some of the devices which can be and have been utilized for this purpose.

Ordinary core drilling apparatus of reasonably large diameters might well be used for obtaining a picture of the nature and disposition of the bottom deposits. The high cost of this type of work and the more or less elaborate equipment necessary makes the use of such methods out of the question for the usual stream survey.

A device which consists essentially of a heavily weighted and sharpened tube which is dropped to the bottom and which may or may not be driven to refusal with a weighted hammer operating along the lifting cable can be used in streams where a clay bottom is present; the clay forms a tight plug in the bottom of the tube and thus retains the sample as the tube is raised to the surface. Figure 5 shows a sampler of this type.

In this sampler an open ended glass tube is inserted into the weighted steel shell and rests on a ledge above the cutting edge. This glass container receives the core sample. A stopper is placed in the upper end of the glass tubing after the sampler is raised to the surface and the tube is removed from the shell by inverting the sampler and pushing the glass container out by means of a suitable ramrod.

Various types of weighted scoops may be used to dredge up samples of bottom deposits. Such a scoop was designed by Special Expert W. C. Purdy, of the United States Public Health Service, for use in the Illinois River and on other stream surveys of the Public Health Service. This scoop is thrown out into the stream and, owing to the weighting on the handle, falls into a position on the bottom as shown in figure 6 so that the cutting edges on the sides will dredge up a sample when the scoop is hauled into the boat or to the shore.

The Richardson dredge has also been used for obtaining bottom sediments. This dredge is essentially a clam-shell bucket constructed of heavy gage sheet metal. The bucket is closed on submergence by means of a strong spring and a sample of the bottom deposit is caught up by the dredge. This dredge will not operate well in very stiff or heavy materials.

An adaptation of the clam-shell dredge was worked out for the Ohio River Pollution Survey by the present writer. A rugged bucket was constructed of heavy boiler plate with an upper box section to receive the dredged material. The sides of the bucket were equipped with transparent windows of thick cellulose acetate so that the captured material could be observed for stratification before emptying the bucket. This apparatus can be operated in very stiff materials such as clays as well as in softer bottom sludges, and will bring up a sizable portion for analysis—one-half cubic foot or more under favorable conditions. Gravel is not so readily brought up by this bucket unless it is intermixed with clay, sand, or silt. Because of its weight (about 100 pounds when empty), some sort of derrick and winch equipment is necessary for handling the bucket, as shown in figure 7. As first designed, this bucket contained a rather deep chamber for receiving the dredged materials. This was found unnecessary for ordinary work as the bucket did not take a large enough "bite" to utilize the full-bucket depth. Also, the deep reservoir raised the center of gravity of the dredge so as to cause it to fall on the side at times and thus miss a collection. This often necessitated several attempts before a sample was obtained. Changes made in the original design cut down the height of the reservoir and made the apparatus easier to handle. The revised design works much better and faster and brings up a good sample.

For the rapid examination of the surface layer of river bottom deposits a special light-weight sampler was devised by the writer for use in the Ohio River Pollution Survey. A somewhat similar but more elaborate device for the same sort of work was described in the Annual Report of the Metropolitan Water Board (London) for 1938. The Ohio River sampler was built of standard brass pipe fittings and structural shapes. The construction is such that when the sampler is suspended freely at the end of the lifting cable with the cup and

scraper in the open position it remains in such a position during descent until the base plate comes to rest on the bottom. A further slacking of the lifting cable permits a free-moving, slightly conical, heavy bronze wedge to drop of its own weight and the cup and scraper are forced together by the steel springs. This action scrapes a portion from the upper layer of the deposit and forces it into the cup.

Upon hauling upon the line for the return trip, a concave depression in the top of the wedge engages the roller lugs on the operating arms and holds the jaws tightly closed against a sponge rubber gasket while the sampler is being lifted. The cup and scraper are adjusted in relation to the base plate so as to remove a sample from the top half inch or so of the bottom deposit when the base plate is resting on the surface of the bottom deposit. Details of this sampler are shown in figure 8. Tests of this apparatus show that it is useful in making a rapid survey of bottom materials. The apparatus seems to work equally well in clay, sand, small gravel, silt (except in suspensions), and in various combinations of these substances. About 100 to 150 ml. of material is brought up in each sample.

LABORATORY EQUIPMENT

It is often necessary to devise special equipment to assist in laboratory analysis of the samples as well as in collection. A description of some of the special apparatus constructed for the analysis of river muds in the Ohio River Pollution Survey might be of interest.

To obtain the sand or grit content of mud samples, an upward flow washer has been devised which washes a portion of the sample free from silt and light suspended matter (fig. 9). This washer consists of a glass tube 2½ inches in diameter containing a home-made diffusing apparatus in the lower end to distribute the wash water flow uniformly and to prevent streaming, and a rate-of-flow meter by which the wash rate may be gauged. In operation, a known portion of the sample is placed in the tube above the diffuser, and, after the upper stopper and outlet drain have been replaced, wash water is introduced from the bottom at a predetermined rate and is permitted to flow until the effluent becomes clear. The water remaining in the washer is then drained off through a bypass valve in the bottom and the grit and other heavy materials are removed from the washer for measurement.

In order to determine the biochemical oxygen demand of the bottom sediment samples by the dilution method, it is desirable to keep that portion of the mud in each test bottle in continual suspension so as to prevent anaerobic conditions which might otherwise occur in the underlying portions if the mud were allowed to settle to the bottom of the bottle and remain undisturbed. To achieve this, a special container was built in which the samples were placed while undergoing

incubation for the required period. This container consists of a wooden box (fig. 10) made of ¾-inch plywood with hinged covers over each row of bottles. The bottles are separated from each other by ¼-inch plywood "egg crate" partitions. This entire box, holding 56 bottles, is fitted at each end with a short section of steel shaft and suspended on bearings so as to rotate freely about its central axis. By means of suitable gearing and pulley arrangements the speed of rotation is fixed at about 1 r. p. m. when driven by a standard 1,750 r. p. m., ⅓ horsepower electric motor. This gives sufficient agitation to keep the materials in each bottle in suspension and thus maintain aerobic conditions in each bottle up to the limit of the oxygen content of the dilution water. The entire mechanism is installed within a 20° C. constant temperature room.

MOBILE LABORATORY UNITS

Among mechanical aids to stream surveys, we may consider mobile laboratory units. The mobile unit permits the laboratory procedure to be brought to the stream and increases greatly the area of operation beyond that which would be possible from a single fixed laboratory. The experience of the Public Health Service in the operation of 6 such units over the entire Ohio River Basin (2 units in 1939 and 4 additional units in 1940), for both routine and special work, has shown that such units have a definite place in stream survey operations and that they are well adapted to rapid and reliable work. Figure 11 shows a typical unit in operation during the Ohio River Pollution Survey in 1940.

No less an aid than the mobile trailer laboratory is the floating laboratory for larger streams. The advantages of such equipment in this work are only too obvious.

The floating laboratory boat "Kiski" (a reconditioned and remodeled U. S. Army Engineer Department quarter boat) shown in figure 12, used by the Public Health Service on the Ohio River Survey, is somewhat unique. It is constructed upon a steel barge and is fitted with complete laboratory equipment, including its own power plant and heating equipment. Figure 13 shows the floor plan and laboratory arrangements for the "Kiski." Samples are supplied to the "Kiski" by both motor boat and automobile collection agencies. Owing to the completeness of the laboratory, a wide range of work can be carried out, comparable in scale to that of a fixed land laboratory. The reach is confined to a field of approximately 60 to 75 miles from the boat. The laboratory is towed from one location to the next as the progress of the survey may require. Here again, our experience with this piece of equipment has been most satisfactory.

FIGURE 8.—Surface sampler for bottom deposits.

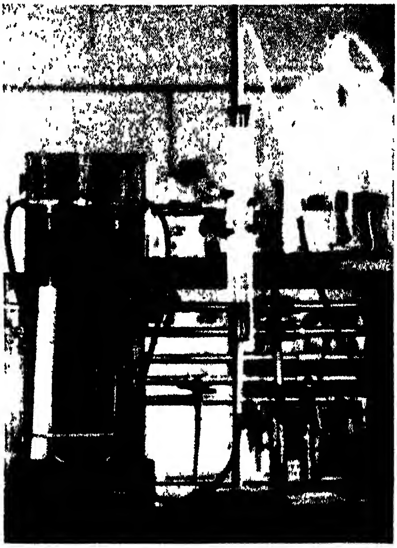

FIGURE 9.—Grit washer.

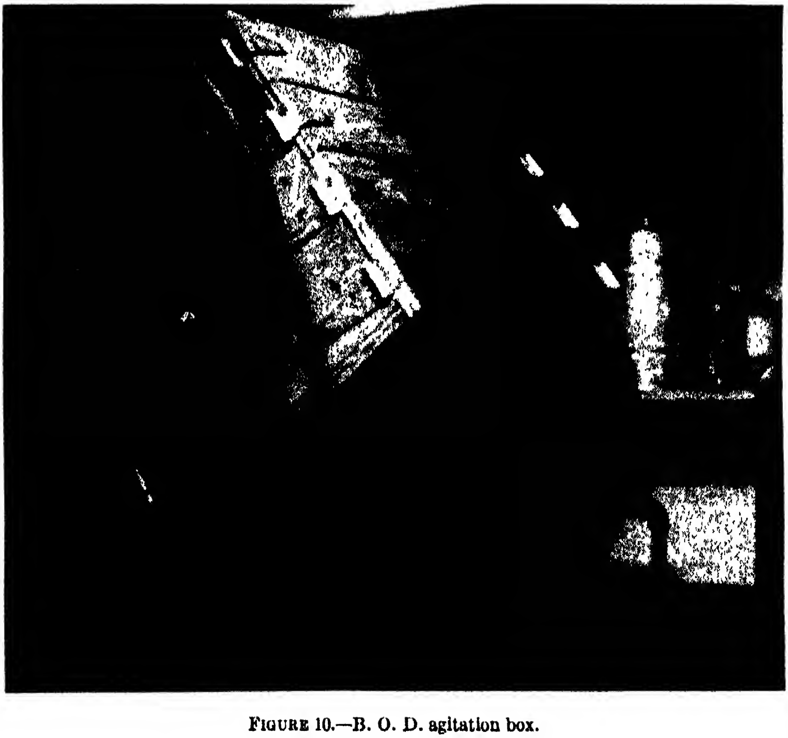

FIGURE 10.—B. O. D. agitation box.

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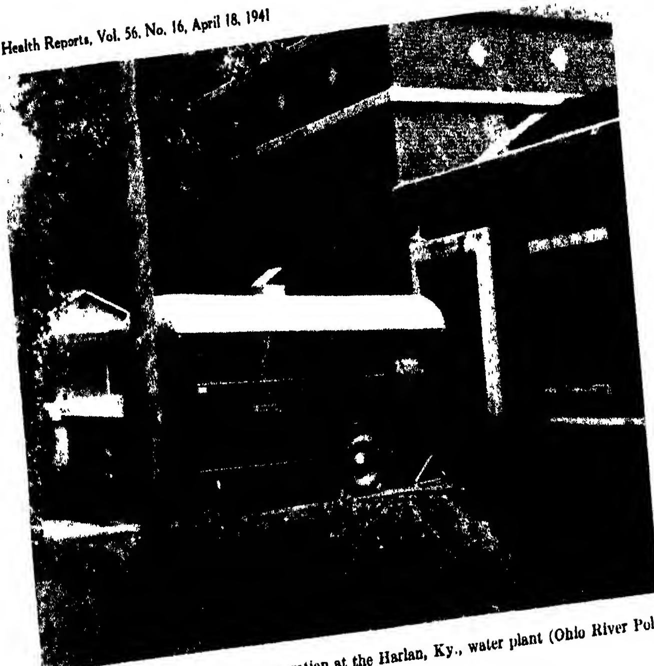


FIGURE 11.—Mobile laboratory unit in operation at the Harlan, Ky., water plant (Ohio River Pollution Survey, 1940).

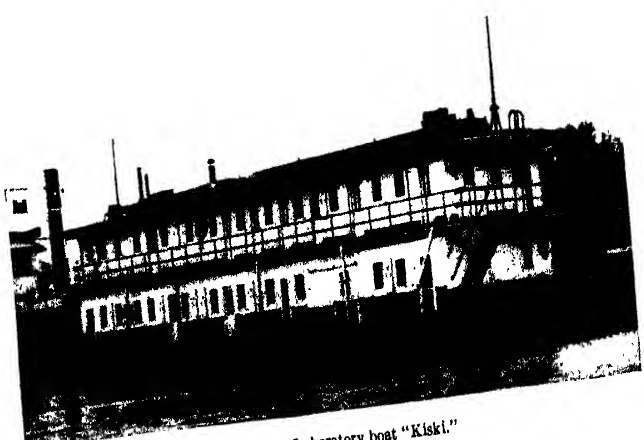
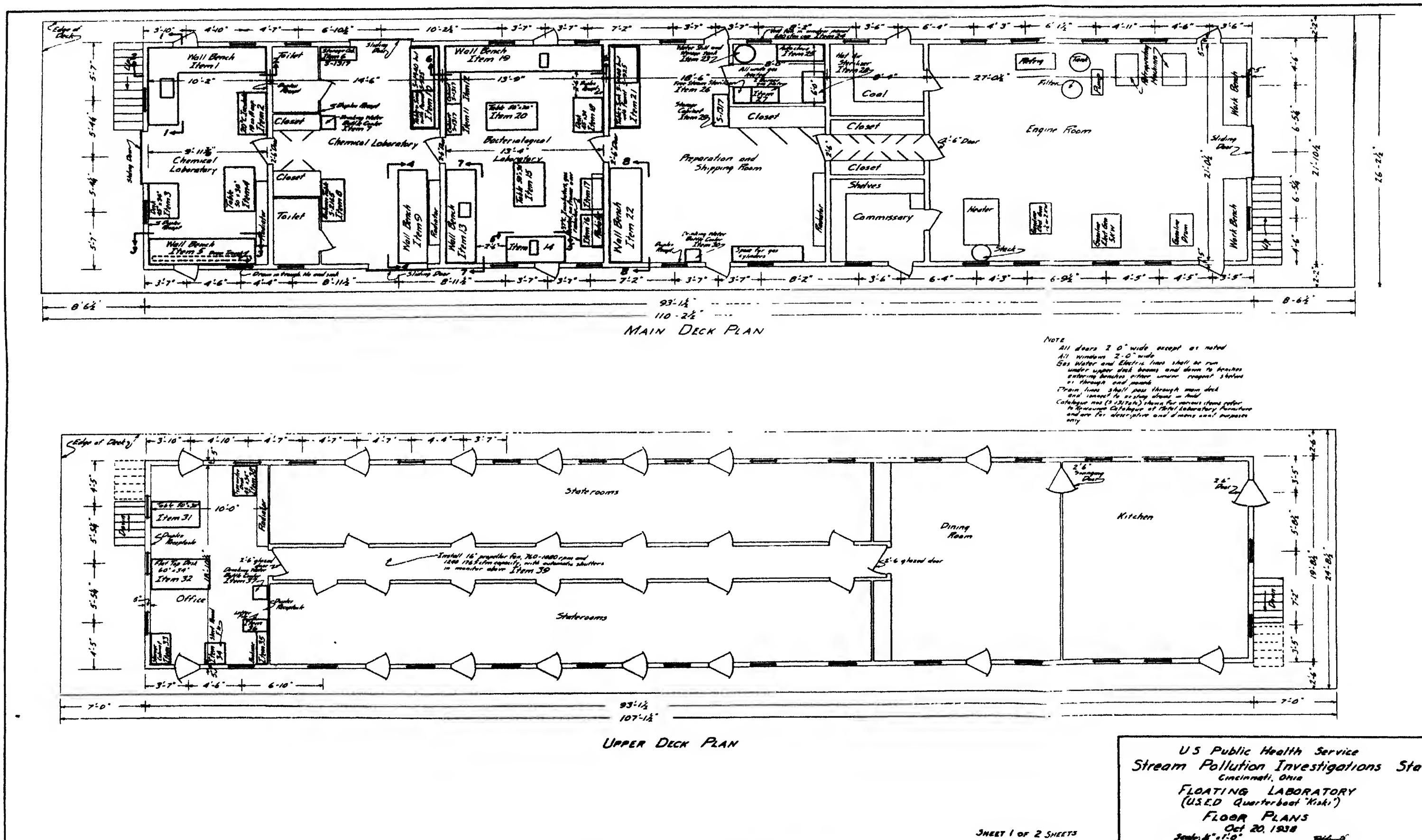


FIGURE 12.—Laboratory boat "Kiski."



(Face p. 820)

FIGURE 13.—Floor plan of laboratory boat "Kiski."

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OTHER EQUIPMENT AND APPARATUS

In addition to the equipment and apparatus which must of necessity be built to suit each job in hand, there is constant development and improvement taking place in laboratory apparatus and techniques which tend to make the results more accurate and which may make possible the routine use of determinations not previously found practical.

We must pay our respects to the multitude of ordinary laboratory apparatus and equipment in daily use which we take for granted quite without thought as to the possible difficulties involved should such equipment not be available, to the automobile as well as other improved methods of transportation and communication which have so greatly increased our working range and efficiency, and, finally, to the computing machines and typewriters which speed up our computations and record our results.

THE NEED OF TRAINED AND SKILLED PERSONNEL

It cannot be too strongly stressed that these many and varied tools have but little value unless they can be intelligently applied by competently trained and reliable personnel who are interested in and skilled at the work in which they are engaged. In this respect, stream studies are no different than other forms of human endeavor which require trained and skilled operators. The deft and sure movements of the skilled worker often make the task look easy to the uninitiated and tend to minimize in the eyes of the observer the actual value of the time and effort spent in the education and training of that worker. The constant improvements being made in apparatus and equipment are generally directed towards the reduction of the amount of human skill and knowledge necessary to accomplish a task accurately. This serves to reduce human effort and at the same time to standardize the accuracy of the output. Many operations can thus be carried out with great accuracy by nontechnically trained but skilled machine operators, leaving the technically trained personnel available for work not as yet adapted to machine methods. While many phases of laboratory operations have become "streamlined" and "mechanized" so that the technician is largely a skilled and specialized machine operator, the far larger part of such work still requires a competent, skilled, well-trained, and experienced personnel for successful and accurate work, and because of the inherent nature of such work human "machines" will probably predominate at the laboratory bench for some time to come.

STUDIES ON IMMUNIZING SUBSTANCES IN PNEUMOCOCCI

XI. EFFECT OF VARIATION IN DOSAGE OF ANTIGENIC POLYSACCHARIDE ON SERUM ANTIBODY TITER IN HUMAN BEINGS [1]

By LLOYD D. FELTON, *Senior Surgeon, United States Public Health Service*, W. ROSS CAMERON, *Deputy State Health Officer, Maryland*, and PERRY FRANKLIN PRATHER, *Consultant, United States Public Health Service*

Ever since the isolation of the pneumococcus as etiologic agent in lobar pneumonia, many investigators have sought practical methods of active immunization of human beings as a means of prevention of this disease. In recent years, the possibility of using an antigenic polysaccharide of pneumococci in lieu of the intact cell vaccine previously tried has received considerable attention. Inasmuch as it has been found possible to prepare such an antigen in a form which is water-soluble, easily sterilized and standardized, and free from producing untoward reactions, an opportunity is afforded for evaluation of this active agent. Obviously, in any program of immunization in human beings, the optimum dose must be determined. This in turn, at least with the pneumococcus antigenic polysaccharide, requires tests on large numbers of individuals because of the wide variation observed in individual response to any one dose. In a preliminary study on a small group (*1*), it appeared that just such variation occurred in the measure of serum antibody titer stimulated by a constant dose of antigen. A more recent study (*2*) on over 1,000 individuals has confirmed this observation, for with a constant dose of antigen the serum antibody titer ranged from zero to protection against a million lethal doses of pneumococci. In other words, the capacity of individuals to manufacture antibody may differ as much as a million fold—truly a significant immunological variable. It has been suggested by us that this difference in individuals may indicate degree of susceptibility to pneumococcus infections; those able to manufacture antibody may be relatively resistant, and those able to manufacture antibody to slight extent or not at all may be susceptible.

Since the demonstration of great variation in host response makes determination of optimum dose possible only when tests are run on large numbers of human beings, significant deductions cannot be made from the work of earlier investigators because of the small numbers of persons tested. For instance, in the 2 reports of Tillett and Francis (*3*) in which skin test doses of the polysaccharide were observed to stimulate antibodies, the studies were made on 19 and 18 pneumonia patients, respectively. In like manner, Finland and Sutliff (*4*) reported on 41 nonserum-treated patients with demonstration of serum antibodies following injection of doses of 0.01 mg. In normal

[1] From the Division of Infectious Diseases, National Institute of Health, and the State Department of Health, Washington County, Md. This is one of a series of studies carried out in part under a grant from the Influenza-Pneumonia Commission of the Metropolitan Life Insurance Co.

individuals, Finland and Sutliff (*5*) reported the presence of protective antibody in serum of 29 individuals following injection of doses of 0.01 mg. Felton, Sutliff, and Steele (*1*) tested, in small groups of individuals, various antigenic fractions of the pneumococcus in 1-mg. dose. More recently, Ruegsegger and Finland (*6*) studied the effects of different doses and of different routes of injection on the response to type VIII polysaccharide in human beings. The routes used were intravenous, subcutaneous, and intracutaneous, with doses ranging from 5 mg. to 0.001 mg., 1 mg. to 0.001 mg., and 0.15 mg. to 0.0001 mg., respectively. There were 31 individuals in the first group, 32 in the second, and 28 in the third, with a maximum of 12 individuals for any 1 dose. Although the response in human beings against this type VIII polysaccharide, as measured by serum antibody titer, was comparable to that obtained with types I, II, or III polysaccharides (Finland and Ruegsegger (*7*)) and the conclusions drawn may later prove to be correct, it is our opinion that insufficient numbers of individuals were tested in each group. In like manner, Finland and Brown (*8*) used type-specific polysaccharides of types I, IV, V, VII, and XIV, in doses of 1 mg. subcutaneously or 0.01 mg. intracutaneously in groups of from 3 to 6 individuals only. It is justifiable to conclude only that their work demonstrated the antigenicity of these polysaccharides in human beings. Francis (*9*) compared the so-called acetylated and deacetylated polysaccharides in 2 groups of 7 individuals. Zozaya and Clark (*10*), testing 10 individuals with 5 weekly injections of 0.01 mg. each, observed protective antibodies with maximum protection against 10,000 lethal doses 1 week after the last injection. These references are given as examples in which it is believed insufficient numbers were studied to warrant any other conclusion than the fact that the specific polysaccharide is antigenic for human beings.

In the present study results are reported on 533 individuals with doses of 1 polysaccharide antigen ranging from 0.01 mg. to 1 mg. In addition, preliminary observations were made in small groups on the effect of 2 injections and also the specificity of the response to polysaccharide antigen. Comparison was also made of the antigenicity of the polysaccharide prepared by the calcium phosphate method (*11*) with that of the Heidelberger (*12*) preparation.

MATERIALS AND METHODS

For determining the optimum dose, 1 polyvalent polysaccharide antigen types I and II prepared by the calcium phosphate method was used. Unfortunately materials for this polyvalent antigen were pooled before analyses were made, so that antigenicity only could be evaluated. Monovalent type-specific polysaccharides were used for

the comparison of antigenicity and specificity of response to preparations by the calcium phosphate method and the Heidelberger method. With the calcium phosphate technique there was 1 preparation each of type I (186–F) and type II (184–F). For comparison, preparations were made by the Heidelberger method from the same 4-day growth of pneumococci (186–H for type I and 184–H for type II), and, in addition, because the supply of 186–H was exhausted, a preparation of type I, 193–H, was used for making comparison in the 0.4- and 0.04-mg. dose series. The strain of pneumococci, the kind of medium, and the period of growth were the same as used in making the 186–F preparation. The medium was double meat infusion broth with 1 percent peptone, 0.5 percent glucose, and 0.2 percent disodium phosphate. Results of chemical tests of the 3 type I preparations were similar but not identical. The nitrogen content for 186–F was 5.05 percent; for 186–H, 4.32 percent; and for 193–H, 3.13 percent; hydrolyzable sugar percentages were 20.4 percent, 24.4 percent, and 19.6 percent, respectively; the amount of protein precipitated from serum with a dilution of 1:5,000 of polysaccharide was 0.318, 0.426, and 0.370 mg.; optical rotation was $[\alpha]_D = +190$, $+180$, and $+220$; the precipitin titer was not determined exactly but the 3 preparations were all over 1:2,000,000; active immunity produced by 0.5 cc. of 1:1,000,000 dilution in white mice was approximately the same for all; mice so injected were immune to 500,000 lethal doses. There is some difference in results of the chemical analyses of the 2 type II preparations. Nitrogen was high in both: 184–F was 1.76 percent and 184–H 1.48 percent; glucose number after hydrolysis was 56 percent in the former and 64 percent in the latter; protein precipitated from immune serum was 0.314 and 0.296 mg., respectively; optical rotation was $[\alpha]_D = +55$ and $+50$; active immunity in white mice was the same in both; mice withstood a 1: 1,000 dilution of culture of such virulence that 0.5 cc. of a 1: 500,000,000 dilution caused a fatal infection in 24 hours, or the mice were protected against at least 500,000 lethal doses.

All antigens were injected in 0.5 cc. volume by subcutaneous route. As described in previous publications, the degree of response is measured by mouse protective titer of the serum; 0.1 cc. serum from bleedings before immunization and 14 days afterward was tested for protection in mice against doses of virulent types I and II cultures ranging logarithmically from 1 to 1,000,000 lethal doses.

The question of the correlation of antigenicity of the polysaccharide in mice and in human beings has not been solved. For that reason, as an initial experiment toward the solution of this problem, results are recorded of the tests of this activity in mice of the polyvalent antigen used here. This assay was carried out in the following manner: 80 mice each for types I and II were injected with 0.5 cc. of 1:1,000,000

dilution of polysaccharide, and on the seventh day afterward, in groups of 20, they were injected intraperitoneally with 0.5 cc. containing 5,000, 50,000, 500,000, and 1,000,000 lethal doses. With our cultures these represented dilutions of 1:100,000, 1:10,000, 1:1,000, and 1:500, respectively. Results of the titrations are given in table 1. In the case of type I, 50 percent of the mice survived a 1:10,000 dilution of culture, or approximately 50,000 lethal doses. The control antigen used in this mouse experiment had an endpoint nearer 1:1,000 culture dilution, or 500,000 lethal doses. With type II, no endpoint was observed; 2 mice survived 1:1,000, 6 survived 1:10,000, and 3 survived 1:100,000 dilution of culture. In our experience, type I preparations have been more uniformly of a higher antigenic titer for white mice than type II. However, preparations of this latter type have been made in which antigenicity in mice was as great as in any type I. Contrariwise, in human beings, almost irrespective of the degree of antigenicity in mice, type II polysaccharides have resulted in stimulation of higher titer antibody than type I samples. Yet it has been observed that any type I or type II preparation which is highly antigenic in mice is also antigenic in human beings. In the present antigen both type I and type II are considered to be of relatively low titer as estimated by the active immunity developed in mice. The more recent preparations, when used in a single injection of 0.5 cc. of 1:1,000,000 dilution, immunize 50 percent of mice against 1,000,000 or 500,000 lethal doses.

TABLE 1.—*Active immunity in mice in response to antigen No. 5*

(Test mice received intraperitoneal injections of 0.5 cc. of a 1:1,000,000 dilution of sample, and 7 days later 0.5 cc. of dilutions of virulent culture as designated below)

Sample	Type	Culture dilutions							
		2×10^{-3}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}
No. 5	I	[1] 2	3	11	13	----	----	----	----
Control P-205C	I	5	8	17	15	----	----	----	----
Control organisms	I	----	----	----	----	[2] 22 46 46	22 22 24	24 46 46	24 24 46
No. 5	II	----	2	6	3	----	----	----	----
Control P-193A	II	----	8	8	10	----	----	----	----
Control organisms	II	----	----	----	----	22 26 26	22 26 26	26 26 26	26 26 S

[1] Numbers indicate survivals of 20 mice.
[2] Numbers indicate hours of survival; S indicates survival.

DETERMINATION OF OPTIMUM DOSE FOR ONE SAMPLE OF POLYVALENT ANTIGEN

In this attempt to establish for human beings the optimum dose of one sample of antigenic polysaccharide polyvalent types I and II, tests were made on 533 persons. The individuals chosen were hospitalized

ambulatory patients and also healthy persons in the general population. Ages ranged from 15 to 70 years with the majority between 30 and 50 years. Because of the small number in any age decade, and also because of the evidence that there is very little difference in response at various ages (*2*), the age factor is not considered in the present observations. The doses of antigen, as indicated in tables 2 and 3, include 0.01, 0.1, 0.2, 0.3, 0.5, and 1.0 mg. The largest numbers studied were injected with 0.5- or 1.0-mg. doses. This was done because it appeared from preliminary work that 0.5 mg. was optimum. Since 1 mg. had been the dose used in most of our earlier work, it was desired to test sufficient numbers of individuals to establish the relative activity of these two doses.

TABLE 2.—*Antibody titer in human sera before and after immunization with antigen No. 5*

TYPE I

Dose of antigen (mg.)	Total number persons (n)	Number of persons (X) whose sera[1] protected against the following lethal doses (Y)								Mean L. D.[3]
		0	1	10	100	1,000	10,000	100,000	1,000,000	
	Before immunization									
0.01	12	10	1	0	0	1	0	0	(2)	83
0.1	52	39	3	3	4	1	2	0	0	412
0.2	90	68	11	6	2	3	0	0	0	36
0.3	52	40	3	4	3	1	1	0	0	218
0.5	218	139	50	4	11	8	6	0	0	317
1.0	109	72	23	4	4	3	3	0	0	307
	After immunization									
0.01	12	3	0	2	0	5	2	0	------	2,085
0.1	52	5	0	6	11	10	8	12	0	24,830
0.2	90	5	4	14	15	19	15	18	0	21,896
0.3	52	3	0	3	9	12	11	11	3	81,210
0.5	218	8	7	7	15	48	64	51	18	109,126
1.0	109	2	1	4	3	21	37	33	8	107,200

[1] 0.1 cc. volume.
[2] Not tested.
[3] Mean L. D.$=\frac{\Sigma XY}{n}$.

For comparison, calculation was made of the simple mean of the number of lethal doses against which 0.1 cc. of serum protected mice. This mean was calculated by multiplying the number of individuals having a given endpoint by the corresponding number of lethal doses, then adding the products for all who received the same dose of antigen, and dividing by the total number who received that dose. As shown in table 2, the average before immunization in the case of type I was relatively small, owing to the fact that the titer was low in those who had any serum antibodies. After immunization, the mean was significantly higher in all, irrespective of the dose of polysaccharide, with a gradual increase from 2,000 lethal doses with 0.01

mg. to 109,000 lethal doses with 0.5 mg. of type I. There was no appreciable difference between 0.5 and 1.0 mg., for 0.1 cc. serum protected against averages of 109,000 and 107,000 lethal doses, respectively. With type II the mean number of lethal doses against which there was protection before immunization was somewhat higher than with type I, but like type I the majority of individuals had no measurable serum protective antibody prior to immunization. It was later observed that there was an increase in the mean number of lethal doses for which there was protection from that with 0.01 mg. to that with 0.2 mg. (59,000 to 189,000, respectively). Although there was variation in the number of lethal doses protected by 0.1 cc. serum in mice, it is difficult to choose the optimum with higher doses, 0.3, 0.5, and 1.0 mg. This variation is no doubt due to unequal distribution with respect to the number of individuals whose serums protected against a million lethal doses. By smoothing the curves, these differences are less pronounced, and it would appear that approximately the same response is obtained in human beings with doses of from 0.3 to 1.0 mg. of this antigen. A larger number of individuals is now being tested to establish this point.

TABLE 3.—*Antibody titer in human sera before and after immunization with antigen No. 5*

TYPE II

Dose of antigen (mg.)	Total number persons (n)	Number of persons (X) whose sera[1] protected against the following lethal doses (Y)								Mean L. D.[3]
		0	1	10	100	1,000	10,000	100,000	1,000,000	
		Before immunization								
0.01	12	9	2	0	1	0	0	0	(2)	9
0.1	52	30	9	1	7	2	3	0	0	629
0.2	90	67	15	1	3	2	2	0	0	248
0.3	52	33	9	5	1	0	4	0	0	772
0.5	218	131	44	6	21	8	6	2	0	1,239
1.0	109	54	30	3	18	2	2	0	0	218
		After immunization								
0.01	12	1	0	1	0	2	1	7	----------	59,334
0.1	52	1	0	1	4	8	17	18	3	95,738
0.2	90	3	0	5	12	16	21	18	15	189,191
0.3	52	1	0	3	5	6	12	13	12	258,202
0.5	218	2	1	4	3	17	74	85	32	189,253
1.0	109	1	1	0	1	9	30	31	36	361,551

[1] 0.1 cc. volume.
[2] Not tested.
[3] Mean L. D. $= \frac{\Sigma XY}{n}$.

As shown in a previous study, certain individuals fail to respond to the polysaccharide antigen. A study of these individuals in the present investigation reveals that certain numbers failed to respond against one type, but did respond to average extent against the other;

and in others there was no indication of stimulation of antibodies against either type. Of the 533 individuals studied (table 4), there were 5 without antibodies to either type, 21 without antibodies against type I but with average reponse to type II, and 3 without antibodies to type II but with some response to type I antigen. These observations suggest again the importance of the host factor in an investigation of active immunization. How far this individual variation is a contributing factor which may influence the incidence of pneumonia is problematic. Yet the question arises whether such variation in response to specific antigen may indicate individual susceptibility to a given type of pneumococcus infection and in turn perhaps may account for the larger number of type I than type II cases of lobar pneumonia. Of course if active immunization can be shown to be a possible means for the prevention of lobar pneumonia, the isolation or synthesis of an antigen active against all types, and more important, sufficiently antigenic to stimulate production of antibody in all individuals, is the ultimate goal.

TABLE 4.—*Failures in response to one type of a polyvalent antigen No. 5 injected in 533 persons*

Number of failures	Number of these positive to other type	Titer of serum antibodies when positive							
		Type	Number of persons whose sera protected against the following lethal doses						
			1	10	100	1,000	10,000	100,000
Type I, 26	21	II	2	1	3	4	5	6
Type II, 8	3	I	1	1	0	1	0	0

EFFECT OF TWO INJECTIONS OF ANTIGEN

Certain observations indicate that it is difficult with any pneumococcus antigen to produce hyperimmunity in the human being. The investigators who have used skin test doses in the study of antibody production in human beings for the most part used repeated injections. Zozaya and Clark (*10*) injected 10 normal individuals with 0.1 mg. in 5 weekly doses and found that 3 out of 10 had negative skin tests but all had some serum antibody. Francis (*9*), in 14 individuals, 7 each with so-called acetylated and deacetylated polysaccharide, used 3 weekly injections of 0.01 mg. each. There was apparently a negative response in 1, very little in 3, and good in the remainder. Finland and Sutliff (*5*), in 19 individuals, gave single injections of 0.01 mg. in 7 against type I, 6 against type II, and 6 against type III, and a similar dose in 10 other individuals, 3 type I, 3 type II, and 4 type III, consisting of 4 successive daily injections. They concluded from their observations that there is no advantage in giving repeated daily doses in skin test amounts as esti-

mated by antibody titer 14 days after the last injection. In groups of approximately 20 individuals, Finland and Dowling (*13*) injected (*a*) 0.01 mg. twice, a week apart; (*b*) 0.05 mg. in single injection; (*c*) 4 to 6 injections of 0.01 mg. at 3- or 4-day intervals; and (*d*) 4 injections of 0.01 mg. at ½-hour intervals. They stated that although there were wide variations in the response of different individuals to the same materials given in the same manner, very little difference was observed in the collective response of different groups of subjects to the same substance regardless of method or total dosage given.

At this time one experiment is reported on the influence of repeated injection of the same polyvalent antigen No. 5 in a group of 15 individuals ranging in age from 21 to 57 years. The first dose of 0.1 mg. was followed in 14 days by 0.2 mg. The usual method of estimating antibody titer, protection of mice by 0.1 cc. serum against varying doses of culture, was used, and also a second method, recorded in table 5, with variation of serum with 50 percent increment against a 1:1,000,000 culture dilution representing 500 lethal doses. All sera were tested on the same day with the same culture. It can be seen that in the case of type I, protection increased in 1 individual from that produced by 0.1 cc. to double that amount, or 0.05 cc. serum; 6 remained the same, and 5 decreased. With type II, 3 showed an increase, 6 remained the same, and 3 decreased. Data are not complete on the others. The group is small, and inasmuch as variation represents in most cases half or double the amount of serum when there is increase or decrease respectively, it is perhaps inadvisable to make any conclusion other than that there is no advantage in 2 injections of this antigen at an interval of 14 days, with the first dose 0.1 mg. and the second 0.2 mg.

TABLE 5.—*Effect of two injections of antigen No. 5, 0.1 and 0.2 mg., respectively, at 14-day interval*

Name	Amount of serum to protect 3 mice against 1:1,000,000 dilution of culture					
	Type I			Type II		
	Before injection	After 0.1 mg.	After 0.2 mg.	Before injection	After 0.1 mg.	After 0.2 mg.
		cc.	cc.		cc.	cc.
D	Negative	0.1	0.1	Negative	0.05	0.1
Car	do	.1	.05	0.05	.006	.012
Cha	do	.1		Negative	.1	
Mu	do	.05	.1	do	.025	.025
McM	do	.05		do	.025	
Raf	do	.025	.05	0.05	.006	.012
Mag	do	.025	.05	0.025	.025	.012
Cas	do	.025	.05	Negative	.05	.05
He	do	.012	.012	do	.012	.012
W	do	.012	.012	do	.012	.006
B	do	.012	.012	do	.05	.05
Ray	do	.012	.012	do	.012	.012
Ro	do	.006	.025	do	.025	.025
Ha	do		.05	do		.05
F	0.05	.1	.1	do	.05	.025

COMPARISON OF PREPARATIONS MADE BY CALCIUM PHOSPHATE AND BY HEIDELBERGER METHODS

Although in our opinion it has been clearly shown that the acetyl group on type I polysaccharide, if present at all or simply as a contaminant, does not influence its antigenicity in mice (*14*), several experiments were run to compare the activity on human beings with type-specific polysaccharides made by the calcium phosphate method and by the Heidelberger method. Efforts were made to follow the Heidelberger method exactly as published. In the type I prepared by this method, there was some acetic acid following vacuum distillation of a sample hydrolyzed in phosphoric acid. There was no demonstrable acetic acid obtained from the other preparations of type I or type II.

These experiments were run for a twofold purpose: First, to ascertain the relative antigenicity of the two preparations in human beings; and second, to compare the degree of heterologous response. It has been reported in a previous work (*15*) that in 12 children type I polysaccharide (prepared by calcium phosphate method) stimulated as much antibody against type II as against type I, while for mice the response to these antigens was definitely homologous. It is realized that this inference was drawn from all too few individuals. Additional data will be necessary to determine whether or not our observations were the result of unequal distribution or whether they represent a constant phenomenon.

TABLE 6.—*Comparison of preparations made by calcium phosphate and by Heidelberger methods.*

TYPE I

Total number of persons	Sample	Dose (mg.)	Type organisms in titration	Number of persons whose sera protected against the following lethal doses: Before injection 0	1	10	100	1,000	10,000	100,000	After injection 0	1	10	100	1,000	10,000	100,000	Mean lethal doses: Before injection	After injection
22	186	1.0	I	12	7	1	0	0	0	2	0	4	1	0	3	3	11	9,092	51,501
			II	10	5	3	2	0	1	1	2	2	4	3	0	9	2	5,011	13,198
15	186-H	1.0	I	6	7	0	1	0	0	1	0	3	1	3	1	1	6	6,674	40,751
			II	10	3	1	0	0	0	1	9	2	1	1	1	0	1	6,667	6,741
11	186	.4	I	8	2	1	0	0	0	0	1	1	1	0	3	3	2	1	21,183
9	193-H	.4	I	5	2	2	0	0	0	0	2	0	1	1	1	1	3	2	34,568
9	186	.04	I	4	3	1	1	0	0	0	3	0	1	2	1	1	1	12	12,357
11	193-H	.04	I	6	1	3	0	0	1	0	1	0	2	2	2	2	2	912	20,202
			II	4	3	1	1	1	1	0	5	2	1	1	0	2	0	1,010	1,828

In summarizing the results in this comparison, the uncorrected mean was calculated as an aid, as in tables 2 and 3. As seen in table 6, 1.0 mg. of type I polysaccharide 186-F (calcium phosphate method)

stimulated antibody such that 0.1 cc. of serum protected mice against an average of 51,000 lethal doses of type I pneumococci. With the same dose of 186–H (Heidelberger method), the average response was against 40,000 lethal doses of type I. This represents the specific response. In this respect there was apparently no significant difference between the antigenicity of these two type I preparations. In contrast, 186–F stimulated a heterologous immunity such that 0.1 cc. of serum protected against an average of 13,000 lethal doses of type II pneumococci, whereas the 186–H preparation showed no difference in titer of type II antibody before and after immunization.

In the 0.4- and 0.04-mg. doses of the two preparations, there was a satisfactory specific response. However, in neither was there observed any indication of heterologous activity.

In the tests of the type II preparations in human beings, a 1-mg. dose was used for each. Twenty-eight were injected with 184–F (calcium phosphate method) and 18 with 184–H (Heidelberger method). As seen from table 7, the highest number of lethal doses used in a test was 100,000; consequently, the average number of lethal doses protected against by 0.1 cc. serum was low in comparison with that given above in the experiment with polyvalent antigen. Although definite conclusions cannot be drawn as to the relative activity of these 2 preparations because of the small number of individuals it may be mentioned that there was a higher percentage of individuals whose sera protected against the highest number of lethal doses with the 184–F antigen than with 184–H; also the smallest number of the low value occurred with the 184–F. The average lethal doses protected against by 0.1 cc. serum in the 2 groups were, respectively, 86,000 and 49,000.

TABLE 7.—*Comparison of preparations made by calcium phosphate and by Heidelberger methods*

TYPE II

Total number of persons	Sample	Dose (mg.)	Type organisms in titration	Number of persons whose sera protected against the following lethal doses														Mean lethal doses	
				Before injection							After injection							Before injection	After injection
				0	1	10	100	1,000	10,000	100,000	0	1	10	100	1,000	10,000	100,000		
28	184	1.0	II	14	11	0	2	1	0	0	0	0	0	0	1	3	24	43	86,821
18	184–H	1.0	II	10	7	0	1	0	0	0	1	0	0	0	1	8	8	5	48,944

DISCUSSION

The main purpose of this paper is to report an attempt to establish for human beings the optimum dose of one preparation of polyvalent types I and II antigenic polysaccharide as measured by serum anti-

body content. The antigen used was prepared by the calcium phosphate method. It was not ideally antigenic as a stimulant for antibody formation in mice. Although an adequate number of experiments may not have been performed, sufficient work nevertheless has been done to suggest that a sample may or may not be antigenic for mice and yet be antigenic in man. It may be advantageous to use on human beings the polysaccharide which is highly antigenic for mice. Efforts are now being made to determine whether such antigens are more active for human beings than the one used in the present study.

Work done prior to the present investigation, by Francis and Tillett, Francis, Finland, and Sutliff, Ruegsegger and Finland, ourselves, and others, unfortunately is of only qualitative nature because of the small numbers of persons studied. The present results indicate that with the type I preparation used, a 0.5-mg. dose is the smallest amount that can be used to stimulate antibody production in the highest titer and in the greatest number of individuals. One mg. is no better. Information is lacking as to what may occur when larger amounts are used. Small numbers of individuals have been tested with 2, 5, and 10 mg., but certainly not enough to draw a significant conclusion. The suggestion of Ruegsegger and Finland that a 5-mg. dose is too large would not be justifiable from the five individuals tested by them. On the other hand, it is shown here that small doses stimulated surprisingly high titer serum antibody in certain individuals. However, the larger the dose up to 1 mg., the larger the number of individuals who showed a good response, and the smaller the number of those who failed to respond. Thus, beginning with the dose of 0.1 mg., in which there were sufficient numbers of individuals injected to indicate significant results, the percentage of failures decreased from 9.6 to 1.8 percent with 1 mg. It should be noted, however, that the percentage of those negative before immunization by chance distribution showed a decrease from 75 percent in those injected with 0.1 mg. to 66 percent in the group injected with 1.0 mg.

The results with type II antigen in the same individuals are similar to those with type I. However, in general, human beings respond much better to type II antigenic polysaccharide than to the same dose of type I. In our study the highest uncorrected mean with type II is 361,000 lethal doses as compared to 109,000 with type I; i. e., 0.1 cc. serum protects mice against these average numbers of lethal doses of the two respective types. It is a little difficult to select the optimum dose with type II inasmuch as the mean for 0.2 mg. is 189,000 lethal doses, for 0.3 mg. 258,000, for 0.5 mg. 189,000, and for 1.0 mg. 361,000 lethal doses. However, it would appear that the high average in the case of the 1 mg. group may be due to an unequal distribution. Thirty-six, or 33 percent of the total number in the group, showed protection against 1,000,000 lethal doses, and of those receiving 0.5

mg. only 32, or 15 percent of the total, showed the same protective titer. As with type I the number of individuals with higher titer of antibody increases with increasing amount of antigen up to 0.2 mg. In addition, the percentage of poor responders decreased with an increasing amount of antigen up to 0.5 mg. The fact that only 50 percent of the total number were negative before immunization with a 1-mg. dose may also be an indication of unequal distribution, for in a previous report on 1,099 individuals (*2*), in the case of both type I and type II, it was shown that 67 percent of the individuals were negative before immunization.

It has been pointed out that the individual variation in response to a given antigen is indicative of relative susceptibility to pneumococcus invasion. It was also suggested that it might be possible to separate those who are able to manufacture antibody from those who are unable to do so, as an initial classification for the study of relative susceptibility of these two groups to pneumococcus. If it is found that poor reactors are more prone to contract pneumonia, then means for increasing resistance of this group might be developed with a resultant decrease in pneumonia incidence. The problem becomes more complex because of the observation made in this study that some individuals respond to polysaccharide from one type of pneumococcus and not to another. Thus, if active immunization becomes the only means of prophylaxis, it would be necessary to determine the response of individuals to more than one antigen and then apply corrective measures against the type in which there is poor response. Certainly these observations indicate the importance of the host factors in any procedure for active immunization. The antigen also must play an important role. In the present report, confirming earlier work, it is shown that type I polysaccharide stimulates antibody in certain individuals against both type I and type II pneumococci. In the polysaccharide prepared by the Heidelberger method, this heterologous response was not evident. This brings up again the question of whether or not there is present a substance or form of antigenic polysaccharide which is common to all types of pneumococci. The failure of one polysaccharide to stimulate antibody against other types may be due to a certain configuration of the molecule which in itself inhibits the heterologous activity. If this is not true, then there may be a concomitant substance present in the polysaccharide prepared by the calcium phosphate method and absent in the Heidelberger preparation which induces the heterologous activity. If either of these two suppositions is true, the possibility exists of isolating a polysaccharide, or altering the specific polysaccharide, to insure a broad non-type-specific response which indeed may be the common denominator of the multiplicity of types found in man.

Some evidence has been presented which would indicate the difficulty of hyperimmunization in human beings with the polysaccharide antigen. This was observed early in our work, and for that reason injections were limited to one dose. Zozaya and Clark showed that repeated injections of skin test doses did not significantly increase antibody titer above that following the first injection. Finland and Sutliff also, in groups of 20 individuals injected singly or in repeated small doses, demonstrated that there was no advantage, as measured by antibody titer, of repeated over single injections. The suggestion from their work that those receiving repeated injections had longer duration of antibody is founded on results with only 2 individuals in a group of 20. In the present report it is shown that not only may repeated injection not be an advantage, but it may even be a disadvantage, at least at an interval of 14 days, for, following the second injection, apparently more than half the persons injected showed a decrease in the case of type I and half the total number in the case of type II. However, as explained above, this variation may simply be due to the lack of sensitivity of the mouse protection test. The interval of 14 days was chosen because it was found that in most individuals optimum titer of antibodies occurred in that time. It is conceivable that a different range of doses at a different interval might result in higher antibody titer; however, our results thus far, as well as those reported by others, have not indicated this possibility. The problem is important, and its solution might well result in the development of a procedure which would decrease individual variation in antibody production, and thus cause a decrease in the number of individuals who failed to respond. Inasmuch as those who fail to respond constitute the most difficult problem, obviously a procedure of active immunization might well become a practical means of the prophylaxis of pneumonia.

SUMMARY AND CONCLUSIONS

Attempts have been made to establish the optimum dose for human beings of one preparation of antigenic polysaccharide of pneumococci, polyvalent types I and II. With this antigen, 0.5 cc. of 1:1,000,000 dilution of which protects mice against 50,000 lethal doses of type I pneumococci, and a slight amount of type II, tests were made in a group of 533 individuals to determine the optimum dose as measured by serum protective antibody titer. The doses ranged from 0.01 mg. to 1.0 mg. of both type I and type II. It may be inferred that for type I 0.5 mg. was as effective as 1 mg. and more effective than 0.3 mg. With type II it is difficult to determine the exact amount; it would appear that 0.3 mg. is as effective as a larger dose.

It has been shown that in this group of 533 individuals, 21 who failed to respond to type I responded well to type II antigen, and 3 who were negative to type II responded to type I.

Two injections of 0.1 and 0.2 mg., respectively, at an interval of 14 days did not result in a significant increase of serum antibody titer either for type I or for type II.

Comparison of polysaccharides made by the calcium phosphate method and by the recent method of Heidelberger gave the following results: The homologous response to 1 mg. of both type I and type II preparations made by the former method was at least as high as that stimulated by preparations by the Heidelberger method; with type I there was heterologous response against type II with the calcium phosphate preparation and none with the Heidelberger preparation; with 0.4- and also 0.04-mg. doses there was no heterologous response; with type II the preparations made by the two methods showed no heterologous antibody stimulation; both stimulated a type-specific response.

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STUDIES ON TRICHINOSIS

XIII. THE INCIDENCE OF HUMAN INFECTION WITH TRICHINAE AS INDICATED BY POST-MORTEM EXAMINATION OF 3,000 DIAPHRAGMS FROM WASHINGTON, D. C., AND 5 EASTERN SEABOARD CITIES [1]

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This report presents the results of the examination for trichinae of 3,000 diaphragms in the so-called "base" series of a general survey which is being conducted for the purpose of ascertaining the distribution of *Trichinella spiralis* in the general population of the United States. Hall and Collins (*1*) have reported on the first 300 cases in this series and Nolan and Bozicevich (*2*) on the first 1,000 cases. It is believed that the number of examinations in this particular

[1] From the Division of Zoology, National Institute of Health.

Previously published papers in this series are:

I. The incidence of trichinosis as indicated by post-mortem examinations of 300 diaphragms. By Maurice C. Hall and Benjamin J. Collins. Pub. Health Rep, 52: 468–490 (1937).

II. Some correlations and implications in connection with the incidence of trichinae found in 300 diaphragms. By Maurice C. Hall and Benjamin J. Collins. Pub. Health Rep., 52: 512–527 (1937).

III. The complex clinical picture of trichinosis and the diagnosis of the disease. By Maurice C. Hall. Pub. Health Rep., 52: 539–551 (1937).

IV. The role of the garbage-fed hog in the production of human trichinosis. By Maurice C. Hall. Pub. Health Rep., 52: 873–886 (1937).

V. The incidence of trichinosis as indicated by post-mortem examinations of 1,000 diaphragms. By M. O. Nolan and John Bozicevich. Pub. Health Rep., 53: 652–673 (1938).

VI Epidemiological aspects of trichinosis in the United States, as indicated by an examination of 1,000 diaphragms for trichinae. By Maurice C. Hall. Pub. Health Rep., 53: 1086–1105 (1938).

VII. The past and present status of trichinosis in the United States, and the indicated control measures. By Maurice C. Hall. Pub. Health Rep., 53: 1472–1486 (1938).

VIII. The antigenic phase of trichinosis. By John Bozicevich and Laszlo Detre. Pub. Health Rep., 55: 683–692 (1940).

IX. The part of the veterinary profession in the control of human trichinosis. By Willard H. Wright. J. Am. Vet. Med. Assoc., 94: n. s. 47: 601–608 (1939).

X. The incidence of light infestations of dead trichinae in man. By Leon Jacobs. J. Wash. Acad. Sci., 28: 452–455 (1938).

XI. The epidemiology of *Trichinella spiralis* and measures indicated for the control of trichinosis. By Willard H. Wright. Am. J. Pub. Health, 29: 119–127 (1939).

XII. The preparation and use of an improved trichina antigen. By John Bozicevich. Pub. Health Rep., 53: 2130–2138 (1938).

XIV. A survey of municipal garbage disposal methods as related to the spread of trichinosis. By Willard H. Wright. Pub. Health Rep., 55: 1069–1077 (1940).

[2] Resigned September 21, 1937.

series has reached a figure which will provide statistically significant conclusions. The series has therefore been discontinued and the present paper represents a final report on the incidence and intensity of infection. The epidemiological aspects of the 3,000 examinations will be dealt with in a separate communication.

The material comprising the present survey was furnished by 10 hospitals in Washington, D. C., and 4 United States Naval Hospitals and 2 United States Marine Hospitals in eastern seaboard cities. Hall and Collins (*1*) have pointed out that necropsy examinations of persons from the District of Columbia would be more representative of the population of the country as a whole than material examined from any other one section because of the cosmopolitan character of the Washington population. The inclusion of the Service hospitals provided a representative sampling of the military and merchant marine groups.

As noted by Hall and Collins (*3*), the sources of material were such as to provide an adequate sampling as regards sex, age, race, occupation, social-economic status, and mental derangement. The type of case usually represented in each of the cooperating hospitals follows: Gallinger Municipal Hospital, cases of relatively low social-economic status, white and colored; Garfield Memorial Hospital, George Washington University Hospital, and Georgetown University Hospital, cases of somewhat higher social-economic status, white and colored; Children's Hospital, children, white and colored, up to 13 years of age; Freedmen's Hospital, cases from the Negro population; St. Elizabeths Hospital, mentally deranged cases more commonly hospitalized over long periods of time; the Veterans' Administration Facility, Mount Alto, cases comprising a one-time military group but now a civilian group; Walter Reed General Hospital, cases from the military land forces, war veterans, and members of the Civilian Conservation Corps; and the United States Naval Hospital, cases from the military population with activities at sea. The following hospitals outside of Washington, D. C., supplied diaphragm material from war veterans and individuals primarily associated with maritime activities: the United States Naval Hospitals at Norfolk, Va., Philadelphia, Pa., Brooklyn, N. Y., and Chelsea, Mass., covering a military population with activities at sea; and the United States Marine Hospitals at Baltimore, Md., and Stapleton, N. Y., covering a civilian population with activites at sea.

EXPERIMENTAL PROCEDURE

The survey was based entirely on the examination of diaphragm muscle taken from routine necropsies without regard to a clinical or anatomical diagnosis of trichinosis. So far as is known, none of the persons represented in the survey died of trichinosis. With the

exception of two cases, the medical history of the infected individuals has not been examined. Therefore, no attempt is made to correlate the trichina infection with a possible occurrence of trichinosis during the life of the individual. One of the two exceptions is a case cited by Hall and Collins (*1*), in which a very heavy trichina infection was encountered at necropsy. The past history, as obtained on admission to the hospital, showed only measles and a gunshot wound. As measles is one of the numerous erroneous diagnoses which have been made in trichinosis, it is possible that this patient was actually suffering from trichinosis at the time this diagnosis was made. The other case concerned an individual on whom we were able to obtain rather complete hospital anamneses.[3] Several days were spent in examining these records and it was evident that this patient, who was found to be heavily infected at necropsy, had probably suffered from trichinosis 2 years before his death, the condition at that time involving a myalgia followed by an "acute nontuberculous inflammatory pulmonary process of undetermined type."

Instructions to the cooperating pathologists called for as much of the diaphragm other than the tendinous portion as was available. We usually received that portion of the diaphragm attached to the central tendon and rarely, if ever, the pillars.

The specimens from the hospitals in Washington were collected once a week. Those from points outside of Washington were forwarded by mail. These specimens were packed in containers with an amount of powdered boric acid sufficient to preserve the specimen while en route. The preservation of the specimens in this manner did not affect the viability of any trichina larvae which may have been in the tissue.

Prior to examination, diaphragms shipped in boric acid were thoroughly washed for more than an hour in running tap water to remove all of the preservative. In the preparation of the diaphragms, all tendinous tissue, fat, and adhering mesenteric tissue were removed. A representative 1-gm. sample was then taken for direct microscopic examination. The remaining portion was weighed and all of it was saved if it weighed 20 gm. or less. If the specimen weighed between 20 and 75 gm., it was trimmed so that its final weight was taken at the nearest 5-gm. division and, if it weighed more than 75 gm., it was trimmed to the nearest 25-gm. division. The weight of the diaphragms ranged from 3 to 200 gm. with a mean of 72.6 gm. In this connection, the average weight of the 300 diaphragms reported on by Hall and Collins (*1*) was 113 gm., while the average weight of the 1,000 diaphragms examined by Nolan and Bozicevich (*2*) was 98 gm.

[3] We are indebted to Passed Asst. Surg. Frederick J. Brady for the examination and evaluation of the clinical records in this case.

In order to ascertain whether significant differences existed between the net weight of the fresh tissue and that of preserved tissue because of the possible drying effect of the boric acid, we examined a series of 100 samples consisting of two equal groups of specimens, one not subjected to boric acid and one preserved by boric acid. The procedure was as follows: A 1- to 10-gm. sample was weighed to the nearest hundredth of a gram and then placed in a vacuum desiccator over concentrated sulfuric acid. The sample was weighed at intervals of several days to a week. The final dry weight was taken when the last two weighings agreed within 0.05 gm. The mean percentage moisture content of the 50 samples preserved with boric acid was 70.6, with a standard deviation of 7.5, and the mean percentage moisture content in the 50 samples not subjected to the boric acid preservation was 77.1, with a standard deviation of 4.9. These results indicate that the boric acid did remove some of the normal moisture content of the muscle but not an amount sufficient to affect significantly the estimated numbers of larvae present in a given amount of tissue.

The examinations for trichinae were carried out essentially by the same two methods used by Hall and Collins (*1*) and by Nolan and Bozicevich (*2*). In the direct microscopic method of examination, the fascia was removed from the muscle and the 1-gm. sample was then cut into small pieces with scissors and compressed between heavy plate glass slides in a steel frame, as described by Nolan and Bozicevich (*2*). The press preparation was examined directly with the low power (12.5 ocular and 1.0 objective) of a dissecting microscope. Positive cases were recorded in terms of the number of trichina cysts present and the type and approximate degree of calcification, if such was present. The state of the larvae within the cysts was recorded as living or dead, and, if dead, their condition was noted as degenerate, partially or completely calcified.

As might be expected, the amount of connective tissue fascia on the 1-gm. sample varied a great deal. Since the fascia was removed before the examination of the muscle, an effort was made to determine the average weight of the tissue discarded. The average weight of the fascia in 236 specimens was 107 ± 3.5 mg.[4] Of these specimens, 116 were from diaphragms preserved in boric acid; the fascia from these specimens had an average weight of 115 ± 5.7 mg. The 120 remaining specimens were from unpreserved diaphragms and the fascia from these specimens was found to have an average weight of 100 ± 4.4 mg. Therefore, the actual weight of the average 1-gm. sample of unpreserved muscle examined was 0.9 gm. and the actual weight of the preserved specimens examined was slightly less than 0.9 gm.

[4] Standard deviation of the mean.

The digestion-Baermann technique used by Nolan and Bozicevich (*2*) was modified slightly. After the diaphragm was weighed, it was finely ground in a meat chopper and placed in artificial gastric juice consisting of 15 gm. of commercial pepsin, 21 cc. of concentrated hydrochloric acid, and 3 liters of water. As prepared, the digestive fluid was about pH 1.25 and at the end of the period of digestion about pH 1.4. The material was then placed in an incubator room and maintained at a temperature of 37° C. for approximately 18 hours, during which time it was stirred continuously by means of an apparatus devised for that purpose. This technique was a departure from the method used by Nolan and Bozicevich (*2*) in which the material was stirred by hand several times during the early part of the digestion process. The continuous stirring resulted in more efficient digestion and was therefore a distinct improvement over the method used previously.

After removal of the digestate from the incubator room the sediment was allowed to settle for 1 hour, following which time two-thirds of the supernatant fluid was drawn off. The Baermann apparatus, consisting of an 80-mesh screen fitted into the top of a 3-liter funnel, was partially filled with water at a temperature of 37° to 45° C. The remainder of the digestate was then poured into the apparatus and water at the above-mentioned temperature was added until the bottom of the screen was covered. The mixture was then allowed to stand for an hour or longer before drawing off about 200 cc. into a conical sedimentation jar. The sediment which settled to the bottom of this jar was then examined for living and dead trichinae and undigested trichina cysts, which were usually calcified. Following the examination of diaphragm No. 1400, this procedure was changed, as follows: Instead of drawing off the fluid from the Baermann apparatus into sedimentation jars, small funnels of about 300 cc. capacity with a short neck closed by means of rubber tubing and a Hofmann clamp were filled with the diluted digest. Two draws were taken from each Baermann funnel at intervals of 1 hour. After these small funnels had stood for an hour or longer, two draws from each were made into Syracuse watch glasses of about 10 cc. capacity. These were immediately examined with the low power (12.5 ocular and 1.0 objective) of a dissecting microscope. The specimens were considered negative if no trichinae or trichina cysts were found in the sediment in the 4 watch glasses. If trichinae or trichina cysts were found, more draws were made into Syracuse watch dishes until 3 consecutive negative draws were secured. In addition, the Baermann apparatus was refilled with warm water and placed in the incubator overnight. The following morning a third small funnel was filled and examined as described above.

Great care was taken to insure that all apparatus was free from contamination with trichinae which may have remained from previous examinations. After being thoroughly washed, all glassware was placed either in a 10-percent solution of sodium hydroxide overnight, a process which destroys any trichinae that may be present, or was subjected to dry heat sterilization. Furthermore, all metal equipment, such as grinders and Baermann screens, was either sterilized with dry heat at 180° C. for 2 hours or flamed after thorough washing and rinsing.

INCIDENCE OF INFECTION

The data concerning the 314 diaphragms found positive in examinations 1,001 to 3,000, inclusive, are listed in table 1. The data on the 174 positive cases found in the first 1,000 examinations were given in like fashion by Nolan and Bozicevich (*2*). Thus, a total of 488 diaphragms were found infected with trichinae in the 3,000 specimens examined, an incidence of 16.3 percent.

If units of 100 consecutive examinations are taken, of which there are 30, the following number of positive specimens per unit were obtained: 22 occurred once; 12, 15, 17, 20, 21, and 24 occurred twice; 11, 13, 14, and 18 occurred three times; and 16 occurred five times. There was thus a wide range of variation in the number of positives found in any 100 cases. The standard deviation of the distribution of the number of positives per 100 cases is 3.67, which divided by the square root of the number of units of 100 gives the figure 0.67 as the standard deviation of the mean. Considering the 3,000 cases as a unit, the standard deviation of the incidence of 16.3 percent is also 0.67 when computed by the formula $\sqrt{\frac{pq}{n}}$, where p is the percentage of positive cases, q the percentage of negative cases, and n the total number of cases examined.

The reports of previous studies on the incidence of trichina infection in the United States have been summarized by Wright (*4*). Since the publication of that paper several other papers on the subject have appeared. Evans (*5*) has reported an incidence of 36 percent in 100 consecutive autopsies at Cleveland, Ohio. In this study relatively large samples of the sterno-mastoid and intercostal muscles were examined in addition to the entire diaphragm. The direct microscopic and digestion-Baermann methods were used. In the diaphragm examinations alone, Evans found 26 percent of the specimens infected with trichinae. The remaining 10 percent were found only in the other two muscles examined. Walker and Breckenridge (*6*), using both the digestion-Baermann and microscopic methods, have found an incidence of trichinae of 33 percent in 100 autopsies in Alabama. As determined by the examination of the diaphragms alone, the inci-

TABLE 1.—*Findings for positive cases*

Positive number	State of trichinae	Findings		Microscopic		Digestion-Baermann			
		Microscopic	Digestion	Number of cysts per gram	State of cysts	Amount of diaphragm digested (gm.)	Total number of larvae recovered	Number per gram	State of larvae
175	Live	Negative	Positive	0		75	3	0.04	Live.
176	Dead	Positive	Negative	1	Degenerated	30	0	0	
177	Mixed	do	Positive	180	All stages of calcification	50	364	7.28	101 live and 263 dead.
178	Dead	do	Negative	1	Polar calcification	75	0	0	
179	Mixed	do	Positive	1	Partial calcification; larva dead	40	4	.1	Live.
180	do	do	do	1	Uncalcified; larva dead	75	2	.03	Do.
181	do	do	do	1	Polar calcification; larva dead	75	3	.04	Do.
182	Live	Negative	do	0		75	1	.01	Do.
183	do	do	do	0		100	2	.02	Do.
184	do	do	do	0		100	5	.05	Do.
185	Dead	Positive	Negative	3	Wholly or partly calcified; larvae dead	30	0	0	
186	Live	Negative	Positive	0		150	2	.01	Do.
187	do	do	do	0		50	1	.02	Do.
188	Dead	Positive	do	3	Calcified; larvae degenerated	40	10	.25	Dead.
189	Live	Negative	do	0		20	1	.05	Live.
190	Mixed	Positive	do	3	Wholly or partly calcified; larvae dead	125	12	.01	7 live and 5 cysts.
191	Dead	do	Negative	1	Calcified; larva degenerated	50	0	0	
192	Live	do	Positive	2	Polar calcification; larvae alive	70	40	.57	Live.
193	do	Negative	do	0		50	3	.06	Do.
194	Dead	Positive	Negative	6	Partly or wholly calcified; larvae degenerated	50	0	0	
195	do	do	do	16	Calcified	100	0	0	
196	Live	Negative	Positive	0		50	14	.28	Do.
197	Dead	Positive	Negative	8	Calcified	125	0	0	
198	Mixed	do	Positive	4	Partial calcification; 3 live larvae, 1 dead	75	1	.01	Do.
199	do	do	do	1	Partial calcification; larva calcified and dead	75	1	.01	Do.
200	Dead	do	Negative	1	Partial calcification	75	0	0	
201	do	do	do	9	Calcified	75	0	0	
202	Live	Negative	Positive	0		30	9	.3	Do.
203	Dead	Positive	Negative	1	Degenerated	50	0	0	
204	do	do	do	2	Polar calcification	16	0	0	
205	do	do	do	1	Calcified	75	0	0	
206	do	do	Positive	8	do	100	1	.01	Dead.
207	Live	Negative	do	0		100	3	.03	Live.
208	do	Positive	do	1	Uncalcified	50	52	1.04	Do.
209	Mixed	do	do	18	Calcified; larvae dead	19	1	.05	Do.
210	Live	Negative	do	0		125	9	.07	Do.
211	do	do	do	0		75	5	.07	Do.

212	Dead	Positive	Negative	21	Calcified	75	0	0	
213	Live	Negative	Positive	0		21	7	.33	Do.
214	do	do	do	0		75	1	.01	Do.
215	Dead	Positive	Negative	1	Calcified	50	0	0	
216	do	Negative	Positive	0		100	1	.01	Dead.
217	do	Positive	Negative	3	Calcified	50	0	0	
218	Live	Negative	Positive	0		125	15	.12	Live.
219	Dead	Positive	Negative	5	Calcified and degenerated	75	0	0	
220	do	do	do	5	do	50	0	0	
221	do	do	do	2	Calcified	75	0	0	
222	Live	do	Positive	11	Polar calcification	100	40	.4	Do.
223	Dead	Negative	do	0		125	2	.02	Dead.
224	do	Positive	Negative	1	Calcified	10	0	0	
225	do	do	do	1	Uncalcified, larva dead	10	0	0	
226	Live	Negative	Positive	0		35	9	.75	Live.
227	do	do	do	0		100	4	04	Do.
228	Dead	Positive	Negative	1	Uncalcified larva dead	75	0	0	Do.
229	Live	do	Positive	3	Polar calcification	50	63	1 3	Do.
230	do	Negative	do	0		50	2	.04	Do.
231	do	do	do	0		75	2	03	Do.
232	do	do	do	0		150	1	.01	Do.
233	Dead	Positive	Negative	1	Polar calcification	125	0	0	
234	do	do	do	1	Uncalcified, larva degenerated	75	0	0	
235	do	do	do	5	Uncalcified and calcified, larvae degenerated	75	0	0	
236	Live	Negative	Positive	0		75	2	03	Do.
237	Dead	Positive	Negative	1	Calcified	50	0	0	
238	do	do	do	2	Uncalcified; larvae dead	75	0	0	
239	Live	Negative	Positive	0		35	11	.31	Do.
240	Dead	Positive	Negative	1	Uncalcified, larva dead	50	0	0	
241	Live	do	Positive	1	Uncalcified, larva alive	50	1	.02	Do.
242	Dead	do	Negative	1	Polar calcification	50	0	0	
243	Live	do	Positive	8	Uncalcified, larvae alive	75	4	.05	Do.
244	Mixed	do	do	1	Calcified; larva dead	100	15	.15	14 live and 1 cyst.
245	Live	Negative	do	0		125	2	02	Live.
246	Dead	Positive	Negative	1	Partial calcification	75	0	0	
247	do	do	do	1	do	25	0	0	
248	do	do	do	1	Calcified	25	0	0	
249	do	do	do	1	do	13	0	0	
250	Live	Negative	Positive	0		75	1	01	Do.
251	do	do	do	0		40	1	.03	Do.
252	do	do	do	0		75	1	.01	Do.
253	Dead	Positive	Negative	9	Calcified and uncalcified, larvae degenerated	50	0	0	
254	Live	do	Positive	1	Uncalcified, larva alive	75	3	.04	Do.
255	do	Negative	do	0		26	2	.08	Do.
256	Dead	Positive	Negative	1	Polar calcification	50	0	0	
257	Live	Negative	Positive	0		75	1	.01	Do.
258	do	Positive	do	1	Uncalcified	75	5	.07	Do.
259	Dead	do	do	5	Calcified	75	1	.01	Dead.
260	do	do	Negative	1	do	25	0	0	
261	do	do	do	20	do	50	0	0	
262	do	do	do	4	Uncalcified, larvae dead	12	0	0	
263	do	do	do	2	Calcified	10	0	0	
264	do	do	do	1	do	100	0	0	

TABLE 1.—*Findings for positive cases*—Continued

Positive number	State of trichinae	Findings: Microscopic	Findings: Digestion	Microscopic: Number of cysts per gram	Microscopic: State of cysts	Digestion-Baermann: Amount of diaphragm digested (gm.)	Digestion-Baermann: Total number of larvae recovered	Digestion-Baermann: Number per gram	Digestion-Baermann: State of larvae
265	Livh	Positive	Negative	1	Calcified	75	0	0	
266	Live	Negative	Positive	0		25	11	.44	Live.
267	Dead	Positive	Negative	1	Calcified	100	0	0	
268	Live	do	Positive	58	Uncalcified	50	1,200	24 0	Do.
269	do	Negative	do	0		75	3	.04	Do.
270	do	do	do	0		75	6	.08	Do.
271	Dead	Positive	Negative	32	Calcified	50	0	0	
272	Live	do	Positive	1	Polar calcification	40	5	.12	Do.
273	Dead	do	Negative	16	Calcified	50	0	0	
274	do	do	do	4	Partially calcified, larvae degenerated	50	0	0	
275	Mixed	do	Positive	9	Calcified; larvae degenerated	50	3	.06	Do.
276	Dead	do	Negative	1	Calcified	50	0	0	
277	Live	Negative	Positive	0		75	23	.3	Do.
278	do	Positive	do	1	Uncalcified; larva alive	40	2	.05	Do.
279	Dead	do	Negative	1	Calcified	50	0	0	
280	do	do	do	11	do	50	0	0	
281	Live	Negative	Positive	0		50	5	.1	Do.
282	do	Positive	do	1	Uncalcified	50	4	.08	Do.
283	do	Negative	do	0		50	5	.1	Do.
284	Mixed	Positive	do	1	Calcified; larva dead	50	7	.14	Do.
285	Dead	do	Negative	3	Calcified	50	0	0	
286	do	do	do	1	do	50	0	0	
287	do	do	do	1	do	75	0	0	
288	do	Negative	Positive	0		50	1	.02	Dead; calcified.
289	do	Positive	Negative	1	Calcified	50	0	0	
290	do	do	do	1	do	50	0	0	
291	do	do	do	11	do	10	0	0	
292	Mixed	do	Positive	2	1 with polar calcification; larva alive—1 calcified; larva dead.	125	56	.5	Live.
293	Dead	do	Negative	1	Calcified	75	0	0	
294	Live	do	Positive	1	Uncalcified; larva alive	25	16	.6	Do.
295	do	Negative	do	0		25	2	.08	Do.
296	do	Positive	do	188	Polar calcification	50	2,300	46.0	Do.
297	do	Negative	do	0		25	1	.04	Do.
298	Dead	Positive	Negative	17	Calcified	100	0	0	
299	Live	do	Positive	13	Polar calcification	24	33	1.38	Do.
300	Dead	do	Negative	3	Partially calcified	75	0	0	
301	Live	Negative	Positive	0		100	26	.26	Do.
302	Dead	Positive	Negative	1	Partially calcified	50	0	0	

303	do	do	do	3	do	13	0	0	
304	Live	do	Positive	12	Polar calcification	50	38	.76	Do.
305	Dead	do	Negative	54	Calcified	75	0	0	
306	Live	do	Positive	1	Uncalcified	75	7	.09	Do.
307	do	Negative	do	0		75	5	.07	Do.
308	Dead	Positive	Negative	26	Polar calcification or totally calcified	100	0	0	
309	Live	do	Positive	18		23	106	4.61	Do
310	do	Negative	do	0		40	1	.03	Do.
311	Dead	Positive	Negative	21	Calcified; larvae degenerated	42	0	0	
312	do	do	do	2	1 with polar calcification, the other totally calcified; larvae dead.	100	0	0	
313	Live	Negative	Positive	0		100	4	.04	Do.
314	Dead	Positive	Negative	3	2 cysts with polar calcification, 1 cyst slightly calcified; larvae dead or degenerated.	50	0	0	
315	Mixed	do	Positive	3	1 cyst uncalcified, larva degenerated; 2 cysts with polar calcification, larvae alive.	50	8	.16	Do.
316	Live	Negative	do	0		50	4	.08	Do.
317	do	do	do	0		75	1	.01	Do.
318	do	Positive	Negative	3	1 cyst slightly calcified, others with polar calcification, larvae apparently alive.	50	0	0	
319	do	do	Positive	1	Slight polar calcification	40	51	1.25	Do.
320	Dead	do	Negative	1	Calcified; larva dead	48	0	0	
321	Live	do	Positive	2	Polar calcification; larvae alive	75	44	.58	Do.
322	Dead	do	Negative	1	Calcified	150	0	0	
323	do	do	do	1	Polar calcification	75	0	0	
324	do	do	do	1	1 pole very slightly calcified	125	0	0	
325	do	do	do	7	Polar or complete calcification	36	0	0	
326	Live	Negative	Positive	0		50	8	.16	Do.
327	do	Positive	do	3	Uncalcified or with very slight polar calcification	50	3	.06	Do.
328	Dead	do	Negative	1	Polar calcification	50	0	0	
329	Live	Negative	Positive	0		50	30	.6	Do.
330	do	do	do	0		75	5	.07	Do.
331	Dead	do	do	0		50	1	.02	1 calcified cyst, larva degenerated.
332	do	Positive	do	104	All stages of calcification; larvae degenerated	150	3	.02	3 calcified cysts, larvae degenerated.
333	Mixed	do	do	3	1 cyst with unipolar calcification, larva alive; 1 cyst with heavy bipolar calcification, larva dead; 1 cyst uncalcified, larva degenerated	125	59	.47	Live.
334	Dead	do	Negative	1	Cyst uncalcified; larva degenerated	50	0	0	
335	do	do	do	12	Lightly calcified; larvae degenerated	50	0	0	
336	Live	do	Positive	1	Polar calcification	50	1	.02	Do.
337	Dead	do	Negative	3	Calcified	75	0	0	
338	do	do	do	1	Polar calcification	150	0	0	
339	do	do	do	2	Uncalcified	50	0	0	
340	do	do	do	1	Calcified; larva degenerated	75	0	0	
341	do	do	Positive	1	Cyst with 1 pole heavily calcified, lighter general calcification, larva dead.	75	3	.04	Dead.
342	Live	Negative	do	0		43	2	.05	Live.
343	Dead	Positive	Negative	1	Polar calcification; larva dead	150	0	0	
344	Live	do	Positive	1	Live	75	38	.5	Do.
345	Dead	do	Negative	1	Calcified; larva degenerated	100	0	0	
346	Live	Negative	Positive	0		38	2	.05	Do

TABLE 1.—*Findings for positive cases*—Continued

Positive number	State of trichinae	Findings		Microscopic		Digestion-Baermann			
		Microscopic	Digestion	Number of cysts per gram	State of cysts	Amount of diaphragm digested (gm.)	Total number of larvae recovered	Number per gram	State of larvae
347	Live	Negative	Positive	0		75	4	.05	Live.
348	do	Positive	do	1	Polar calcification	100	11	.11	Do.
349	Dead	Negative	do	0		48	1	.02	1 calcified cyst; larva degenerated.
350	Mixed	Positive	do	11	Calcified; larvae dead or degenerated	13	1	.07	Live.
351	Dead	Negative	do	0		75	2	.02	Dead.
352	Live	do	do	0		150	3	.02	Live.
353	do	do	do	0		38	1	.03	Do.
354	Dead	Positive	Negative	81	Partially or wholly calcified	125	0	0	
355	do	do	do	1	Polar calcification	50	0	0	
356	do	do	do	1	Calcified	3	0	0	
357	do	do	do	2	do	16	0	0	
358	do	Negative	Positive	0		90	6	.07	Dead.
359	do	do	do	0		35	1	.03	Do.
360	do	do	do	0		19	1	.05	Do.
361	Mixed	do	do	0		120	13	.11	1 live, 12 dead.
362	Dead	Positive	Negative	27	Calcified; larvae degenerated	130	0	0	
363	Live	Negative	Positive	0		50	2	.04	Live.
364	Dead	do	do	0		45	1	.02	Cyst; larva dead.
365	Live	do	do	0		60	2	.03	Live.
366	Dead	Positive	do	1	Calcified; larva degenerated	35	1	.03	Cyst; larva dead.
367	do	do	Negative	1	Calcified; larva dead	55	0	0	
368	do	do	do	3	Calcified	30	0	0	
369	do	do	do	4	do	100	0	0	
370	Mixed	do	Positive	1	Calcified, larva dead	55	7	.13	Live.
371	Dead	Negative	do	0		70	1	.01	Calcified cyst; larva dead.
372	Mixed	Positive	do	1	Calcified; larva degenerated	35	10	.31	7 live, 3 calcified cysts with dead larvae.
373	Live	Negative	do	0		100	6	.06	Live.
374	do	Positive	do	4	Uncalcified	55	17	.3	Do.
375	Mixed	Negative	do	0		11	2	.18	1 live, 1 cyst with dead larva.
376	Dead	Positive	Negative	5	Calcified; larvae degenerating	50	0	0	
377	Mixed	do	do	3	Calcified; 1 dead and 2 live larvae	60	0	0	
378	Live	Negative	Positive	0		50	1	.02	Live.
379	do	do	do	0		30	2	.07	Do.
380	Mixed	Positive	do	15	All degrees of calcification, but chiefly bipolar; 10 live larvae, 5 dead.	30	52	1.7	42 alive, 10 dead.

381	do	do	do	1	Calcification complete	125	7	.06	5 alive, 2 dead.
382	Dead	Negative	do	0		50	1	.02	Dead.
383	Live	do	do	0		40	1	.03	Live.
384	Mixed	Positive	do	1	Calcified, larva degenerated	100	4	.04	Do.
385	do	do	do	25	6 live, 19 dead; all show bipolar calcification	70	1	.01	Do.
386	Dead	do	Negative	24	Even calcification; some larvae calcified	70	0	0	
387	Live	do	Positive	1	Cyst calcified, larva alive	55	3	.05	Do.
388	Dead	do	Negative	8	Calcified	45	0	0	
389	Mixed	do	Positive	1	Calcified, larva dead	30	2	.07	Do.
390	Live	Negative	do	0		125	15	.12	Do.
391	Dead	Positive	Negative	3	Calcified	75	0	0	
392	Live	Negative	Positive	0		95	1	.01	Do.
393	Dead	Positive	Negative	1	Calcified	70	0	0	
394	Mixed	do	Positive	2	Slightly calcified, larvae alive	45	36	.8	34 alive, 2 dead.
395	do	do	do	14	Bipolar calcification heavier at one pole, 9 live, 5 dead.	45	541	12.02	485 alive, 54 dead, 2 cysts with dead larvae.
396	Dead	do	Negative	5	Internal calcification	85	0	0	
397	Live	Negative	Positive	0		55	2	.04	Live.
398	Mixed	Positive	do	9	All calcified, some with bipolar calcification, alive	95	49	.51	47 alive, 2 dead.
399	Live	do	do	1	Calcified	65	7	.1	Live.
400	do	do	Negative	1	do	40	0	0	
401	Mixed	do	Positive	1	Bipolar calcification, larva alive	10	2	.2	1 cyst, 1 dead larva.
402	Dead	do	Negative	1	Calcified	16	0	0	
403	Live	Negative	Positive	0		90	7	.08	Live.
404	do	do	do	0		110	16	.15	Do.
405	do	do	do	0		55	1	.02	Do.
406	Mixed	Positive	do	14	All cysts calcified, 3 calcified larvae, 11 live larvae	95	3	.03	1 live, 2 dead.
407	Dead	do	Negative	1	Calcified	10	0	0	
408	Mixed	do	Positive	1	Unipolar calcification, larva dead	75	4	.05	Live.
409	Live	do	do	2	Calcified	75	23	.3	Do.
410	Mixed	Negative	do	0		75	3	.04	2 live, 1 dead.
411	Live	Positive	do	2	Slightly calcified	65	6	.09	Live.
412	Mixed	do	do	1	Bipolar calcification, larva degenerated	100	9	.09	8 live, 1 cyst.
413	Live	Negative	do	0		14	2	.14	Live.
414	Dead	Positive	Negative	2	Calcified, larvae calcified	22	0	0	
415	Mixed	do	Positive	2	Bipolar calcification; 1 live, 1 dead larva	75	215	2.87	1 cyst, 55 dead, 159 alive.
416	Live	Negative	do	0		7	21	3	Live.
417	Dead	Positive	Negative	2	Bipolar calcification, 1 larva calcified, the other degenerated.	50	0	0	
418	do	Negative	Positive	0		65	1	.02	Cyst, dead.
419	do	Positive	Negative	2	Calcified, larvae calcified	50	0	0	
420	Mixed	do	Positive	1	Slightly calcified, larva dead	10	4	.4	3 dead, 1 alive.
421	Live	Negative	do	0		20	1	.05	Live.
422	do	do	do	0		40	2	.05	Do.
423	Dead	Positive	Negative	6	Calcified, larvae degenerated	25	0	0	
424	do	do	do	1	Bipolar calcification	125	0	0	
425	Mixed	Negative	Positive	0		19	10	.53	7 live, 3 dead.
426	Live	do	do	0		76	4	.05	Live.
427	Dead	Positive	Negative	9	Calcified, larvae calcified	100	0	0	
428	Live	Negative	Positive	0		15	7	.46	Do.

TABLE 1.—*Findings for positive cases*—Continued

Positive number	State of trichinae	Findings		Microscopic		Digestion-Baermann			
		Microscopic	Digestion	Number of cysts per gram	State of cysts	Amount of diaphragm digested (gm)	Total number of larvae recovered	Number per gram	State of larvae
429	Mixed	Positive	Negative	2	Slight bipolar calcification, 1 larva degenerated and 1 calcified.	30	22	.73	14 dead, 8 live.
430	Dead	do	Negative	1	Slight calcification, larva calcified	40	0	0	
431	Live	Negative	Positive	0		15	2	.13	Live.
432	do	Positive	do	4	Bipolar calcification, larvae alive	45	2	.05	Do.
433	do	Negative	do	0		50	3	.06	Do.
434	Dead	Positive	Negative	1	Bipolar calcification, larva dead	60	0	0	
435	Mixed	do	Positive	1	Larva alive	30	14	.47	12 live, 2 dead.
436	Dead	do	Negative	9	Slightly calcified, larvae dead, calcified or degenerate.	65	0	0	
437	Live	do	Positive	1	Slight bipolar calcification, larva alive	70	1	.01	Live.
438	do	Negative	do	0		50	1	.02	Do.
439	Mixed	do	do	0		45	24	.53	23 live, 1 dead.
440	Dead	Positive	Negative	2	Slightly calcified, larvae degenerate	7	0	0	
441	do	do	do	1	Larva degenerate	45	0	0	
442	do	do	do	1	Larva dead and calcified	50	0	0	
443	do	do	do	8	Larvae dead, cysts with varying calcification	35	0	0	
444	Mixed	Negative	Positive	0		35	6	.17	3 live, 3 dead.
445	do	Positive	do	1	Slightly calcified, larva calcified	75	20	.27	Live.
446	Dead	Negative	do	0		25	1	.04	Cyst, larva calcified.
447	Mixed	do	do	0		100	3	.03	2 live, 1 dead.
448	Dead	do	do	0		20	1	.05	Dead.
449	do	Positive	Negative	1	Larva degenerate, cyst calcified	25	0	0	
450	Mixed	Negative	Positive	0		25	18	.72	16 live, 2 dead.
451	Dead	Positive	Negative	1	Cyst and larva calcified	35	0	0	
452	Live	Negative	Positive	0		25	2	.08	Live.
453	Dead	Positive	do	2	Calcified, larvae degenerate	75	2	.03	Cysts, dead.
454	Live	Negative	do	0		75	4	.05	Live.
455	do	do	do	0		55	1	.02	Do.
456	Dead	Positive	Negative	1	Calcified	50	0	0	
457	Mixed	do	Positive	1	Slight bipolar calcification, larva alive	30	20	.67	18 live, 2 dead.
458	Dead	do	Negative	6	Bipolar calcification, 1 larva calcified, 5 degenerate	100	0	0	
459	Mixed	do	Positive	2	1 cyst with bipolar calcification, larva alive, 1 generalized calcification.	25	2	.08	Live.
460	Live	Negative	do	0		100	5	.05	Do.
461	Dead	Positive	Negative	8	Bipolar calcification, larvae calcified	75	0	0	
462	Mixed	do	Positive	1	do	70	5	.07	4 live, 1 dead.
463	Live	do	do	1	Very slightly calcified	55	82	1.5	Live.
464	Mixed	Negative	Positive	0		60	14	.23	9 dead, 5 live.
465	Dead	do	do	0		100	2	.02	2 dead.

466	Mixed	do	do	0		18	4	.2	3 dead, 1 live.
467	Live	do	do	0		55	10	.2	Live.
468	Dead	Positive	Negative	2	Calcified, larvae degenerate	70	0	0	
469	Mixed	do	Positive	1	Calcified, larva alive	100	13	.13	12 live, 1 dead.
470	do	do	do	6	Larvae and cysts calcified	35	1	.03	Live.
471	Dead	do	Negative	2	1 larva and cyst calcified, 1 polar calcification, larva dead.	14	0	0	
472	Mixed	do	Positive	1	Slight bipolar calcification, larva degenerate	65	1	.02	Do.
473	Dead	Negative	do	0		65	1	.02	Cyst, dead.
474	Live	do	do	0		35	1	.03	Live.
475	Dead	Positive	Negative	2	Calcified	35	0	0	
476	do	do	do	1	do	25	0	0	
477	Mixed	Negative	Positive	0		25	3	.12	2 live, 1 dead.
478	Live	do	do	0		55	1	.02	Live.
479	do	do	do	0		30	1	.03	Do.
480	do	do	do	0		55	1	.02	Do.
481	Mixed	do	do	0		150	21	.14	14 dead, 7 live.
482	do	Positive	do	34	15 dead; 2 calcified, 4 heavily calcified cysts; all but 1 cyst with bipolar calcification, more than 1 larva in several cysts.	65	1,315	20.2	2 cysts; more than 50 percent of larvae dead.
483	Dead	do	Negative	1	Larva and cyst calcified	30	0	0	
484	do	do	do	1	do	100	0	0	
485	do	do	Positive	28	Larvae and cysts heavily calcified	100	6	.06	Cysts, dead.
486	Mixed	do	do	4	3 live; 1 calcified larva. Bipolar calcification	30	11	.37	2 live, 8 dead, 1 cyst.
487	Dead	do	Negative	4	Polar calcification	40	0	0	
488	do	do	do	2	Bipolar calcification, larvae calcified	40	0	0	

dence was 25 percent, the remaining positives being found in the intercostal, rectus abdominis, and pectoral muscles. Hood and Olson (*7*) have examined the diaphragms from 428 necropsies in the Chicago area. In the first 208 examinations, in which only the digestion method was used, 12 were found positive for trichinae, an incidence of 5.77 percent. The remaining 220 examinations were carried out by the digestion and microscopic methods and 25, or 11.36 percent, were found positive; a higher incidence was obtained when greater quantities of diaphragm muscle were used. Sawitz (*8*) reported an incidence of 6 percent in 400 examinations of diaphragm and pectoral muscle from unselected autopsies in New Orleans. The examination of the diaphragms revealed 87 percent and of the pectoral muscle 56.5 percent of the positives. Butt and Lapeyre (*9*) at Los Angeles found 18.2 percent of 170 diaphragms infected with trichinae.

The reports of Evans, Walker and Breckenridge, and Hood and Olson illustrate the increase in incidence which is obtained by using either more muscle or other muscles in addition to the diaphragm, and both the direct microscopic and digestion-Baermann methods. Our data further substantiate the results as regards the latter point, for the microscopic method detected an incidence of 10.7 percent and the digestion-Baermann method an incidence of 10.2 percent in the 3,000 examinations. Sixty-six percent of the 488 positive specimens were detected by the microscopic method and 62.7 percent by the digestion method. The use of either technique alone would have failed to detect approximately one-third of the infections. In addition, one of us (Jacobs (*10*)), using the direct microscopic method, studied a 10-gm. sample from each of 100 specimens received and recorded as negative by routine methods. He found 6 positive specimens in these 100 examinations, thus indicating that our incidence figure is probably less than the true incidence. It is therefore obvious that we have not uncovered all of the infections in the cases from which specimens of diaphragm muscle have been examined. However, the methods outlined above have disclosed all the heavy infections which undoubtedly represented clinical trichinosis at some time or other as well as numerous light infections of unknown bearing on the health of the individual. Probably our technique has failed to disclose some infections of dead trichinae of the order of less than one larva per gram.

From the practical standpoint of the health of the individual, the cases with less than one larva per gram are probably without significance. However, they are of value as adding emphasis to existing data showing the widespread distribution of the parasite in the population and of delineating further the potential hazards involved in the present haphazard methods of dealing with this important public health problem.

The efficiency of the two methods of examination with respect to the state of the larvae is given in table 2. It will be noted that the digestion method detected 128, or 73.1 percent, of the 175 infections with live larvae only and 261, or 98.9 percent, of the 264 infections in which live larvae were encountered, including cases with mixed live and dead larvae. The microscopic method detected 179, or 79.9 percent, of the 224 infections in which only dead larvae were found and 275, or 87.9 percent, of the 313 infections in which dead larvae were encountered, including cases in which both live and dead larvae were present. As would be expected, the microscopic method was more efficient in detecting infections with dead larvae and the digestion method more effective in detecting infections with live larvae.

TABLE 2.—*The respective efficiency of the microscopic and digestion-Baermann methods, singly and together, in detecting infection with live, dead, and mixed live and dead trichinae in 488 positive cases examined by both methods*

State of larvae	Positive cases		Efficiency of methods of examination employed					
			Cases detected only by microscopic method		Cases detected only by digestion method		Cases detected by both methods	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Live	175	35 9	2	1.2	128	73 1	45	25.7
Dead	224	45 9	179	79 9	23	10.3	22	9.8
Mixed live and dead	89	18.2	1	1 1	15	16.9	73	82.0
Total	488	100	182	37 3	166	34.0	140	28.7

TABLE 3.—*Cooperating hospitals listed with relation to the number of diaphragms furnished, percent of total diaphragms, and number and percent of positive cases*

Hospital	Number of diaphragms furnished	Percent of total diaphragms	Number of diaphragms positive	Incidence percent
A. Washington, D. C, hospitals				
Gallinger Municipal Hospital	634	21.1	112	17.7
Veterans' Administration Facility	229	7.6	40	17.5
George Washington Hospital	30	1 0	5	16.7
Freedmen's Hospital	162	5.4	26	16.0
St. Elizabeths Hospital	581	19 5	90	15 5
Garfield Memorial Hospital	154	5 1	23	14 9
Georgetown Hospital	7	.2	1	14.3
U. S. Naval Hospital	51	1 7	7	13 7
Walter Reed General Hospital	410	13 6	55	13 4
Children's Hospital	72	2 4	3	4.2
Total	2,330	77.7	362	[1] 15.5
B. Hospitals outside of the District of Columbia				
U. S. Marine Hospital, Baltimore, Md	334	11.1	72	21.6
U. S. Naval Hospital, Brooklyn, N. Y	5	.2	1	20.0
U. S. Naval Hospital, Chelsea, Mass	59	2.0	11	18.6
U. S. Naval Hospital, Philadelphia, Pa	206	6.9	35	17.0
U. S. Marine Hospital, Stapleton, N. Y	63	2.1	7	11.1
U. S. Naval Hospital, Norfolk, Va	3	.1	0	0
Total	670	22 3	126	[2] 18.8
Grand total	3,000	100 0	488	[3] 16.3

[1] Standard deviation of 15.5 percent is ± 0.75.
[2] Standard deviation of 18.8 percent is ± 1.57.
[3] Standard deviation of 16.3 percent is ± 0.67.

Table 3 shows the number of specimens received from the various cooperating hospitals and the incidence of infection for each hospital. In order to secure a local incidence figure for the District of Columbia, the cooperating hospitals in Washington, D. C., have been listed separately from those located in other cities. While it is recognized that material from such hospitals as Walter Reed, the Naval Hospital, and the Veterans' Administration Facility may not necessarily come from local residents and that the inclusion of the data from these hospitals may weight the series, it is believed that the figure, 15.5 percent, with a standard deviation of 0.75, probably represents the incidence for the District of Columbia.

The examination of the 670 diaphragms received from hospitals located outside of Washington, D. C., revealed a trichina incidence of 18.8 percent with a standard deviation of 1.57. Many of these diaphragms came from individuals who, because of their military or merchant marine connection, probably moved periodically from place to place and therefore had been subjected to varying opportunities for infection in the various localities in which they lived. Since this incidence is not significantly different from that found in the diaphragms from the hospitals in the District of Columbia, it seems probable that the incidence of 16.3 percent for the series as a whole is not materially different from that which may be found in other sections of the United States.

There is, however, a possible further qualification of this figure in that the population represented is for the most part an urban population. Swine fed on raw garbage are the chief source of human trichinosis and most of the garbage-fed hogs are marketed in cities. It is thus reasonable to expect a higher incidence of trichinae in an urban population than in a rural population. The proof of this supposition remains to be verified by a survey of the rural population which is being conducted at the present time and on which a report will be made later.

INTENSITY OF INFECTION

Hall and Collins (*1*) and Nolan and Bozicevich (*2*) classified their positive cases into seven arbitrary groups on the basis of the intensity of the infection. This grouping is also used in this paper. The numbers of cases in the various groupings are presented in table 4. The assignment to the various groups was made on the basis of the microscopic findings, when positive, because of their direct and positive character; the digestion-Baermann findings per gram were used for the other cases. All of the cases in group 1 are classified on the basis of the digestion-Baermann findings. The cases in the remaining groups, with the exception of two in group 2, are classified on the basis of the microscopic findings.

TABLE 4.—*Intensity of infection in terms of larvae per gram in 488 positive diaphragms*

Group number	Larvae per gram	Number of cases	Percent	Number of cases with larvae in the various states		
				Live	Dead	Mixed
1	Less than 1	167	34.2	128	24	15
2	1-10	258	52.9	39	162	57
3	11-50	48	9.8	5	29	14
4	51-100	7	1.4	1	4	2
5	101-500	5	1.0	2	2	1
6	501-1,000	3	.6	0	3	0
7	Over 1,000	0	0	0	0	0
Total		488	100.0	175	224	89

The percentage of positive cases falling in each group shows no significant change from that reported by Nolan and Bozicevich (*2*). If those cases with over 100 larvae per gram are considered as representing possible cases of clinical trichinosis, as has been suggested by Hall and Collins (*1*), then 8, or 1.6 percent, of our 488 positive diaphragms were from individuals who at one time probably suffered from clinical trichinosis.

Hall and Collins suggested the theory that the rapidity with which trichinae die and calcify is proportional to the degree of infection. It is felt that the data obtained subsequent to that for which the theoretical explanation was offered neither strengthen nor disprove the explanation. Cases with relatively heavy infections are too few to warrant any conclusions at this time.

SUMMARY

This paper presents a final report of the results of the examination for trichinae of 3,000 diaphragms in a series of specimens obtained from 10 hospitals in Washington, D. C., and 4 United States Naval Hospitals and 2 United States Marine Hospitals in eastern seaboard cities. Results of the first 300 examinations in this series were reported by Hall and Collins (*1*), and the results of the first 1,000 examinations by Nolan and Bozicevich (*2*). A total of 488, or 16.3 percent, of the 3,000 diaphragms were found positive for trichinae. The standard deviation of the incidence figure is 0.67.

Of the 3,000 diaphragms, 2,330 came from hospitals in Washington, D. C. Of these 2,330 specimens, 362, or 15.5 percent, were infected with trichinae. The standard deviation of this incidence figure is 0.75. The remaining 670 diaphragms came from Service hospitals located in cities other than Washington, D. C. Of these 670 specimens, 126, or 18.8 percent, were positive for trichinae. The standard deviation of this figure is 1.57. It is believed that the percentage of individuals positive for trichinae in the present series will not differ materially from that which may be found in similar population groups in other parts of the United States.

Both the direct microscopic and the digestion-Baermann methods were used in examining the diaphragms. The direct microscopic method was almost 90 percent effective in detecting infections in which dead larvae were present; the digestion-Baermann method detected all but one of the infections in which live trichinae were present. Of the 488 positive diaphragms, 220 contained dead larvae only, 175 contained live larvae only, and 89 were found infected with both live and dead larvae.

The findings in the majority of the positive cases indicated that the individuals represented had fairly light trichina infections. On the other hand, 1.6 percent of the positive diaphragms contained more than 100 larvae per gram, and in such cases it is reasonable to assume that the persons represented probably suffered from clinical trichinosis at some time.

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MEDICAL AND NURSING SERVICES FOR THE MATERNAL CASES OF THE NATIONAL HEALTH SURVEY [1]

Record of the amount and kind of medical and nursing care received in cases of illness occurring during a 12-month period was obtained in the National Health Survey, an enumeration of 2,500,000 white and colored persons in 83 cities. The cities were so selected according to size and geographic region as to give a sample representative in general of cities in the United States. The present report deals with the extent to which certain medical and nursing services were received by confinement cases.

White women in urban communities.—Care of the confinement case in cities was largely under the supervision of physicians, at least 95 percent of the cases in each economic group being so attended. Hospitalization rose sharply with income; the rate in the total group was 65 percent. For the proportion of cases reported as receiving no care from physicians, the reverse relation obtains. These relations are observed in cities of different sizes and in different regions, but the degree of change with income varies. Small cities (under 25,000) of the South deviate from the experience of the total group most strikingly, the increase in hospitalization with income and the inverse rela-

[1] Goddard, Jennie C.: Medical and Nursing Services for the Maternal Cases of the National Health Survey. Public Health Bulletin No. 264. U. S. Government Printing Office, 1941. Available from the Superintendent of Documents, Washington, D. C., at 15 cents per copy.

tion in the proportion receiving no medical care being more pronounced than in other city-size and region groups.

About 80 percent of the maternal cases received nursing care. Among the more important findings relative to the proportion of maternal cases which received nursing care are (*a*) the tendency for increase with income among the total group of cases and among those in cities of different sizes and in different regions; (*b*) the greater variation in small than in large cities; and (*c*) the relatively greater frequency of visiting nursing service among cases in families of low income than among the more well-to-do.

Among that third of the cases which were not hospitalized, 38 percent received nursing care. Although women in relief families received nursing care with greater frequency than those in the nonrelief groups except the group with incomes of $2,000 and over, care of those in the relief group consisted largely of visiting nursing service and receipt of care from private-duty nurses increased markedly with income. These inequalities are of importance in view of the diverse character of the two types of care. In each region, a higher proportion of cases in the relief group received nursing care than of those in the nonrelief groups in large cities (100,000 and more); the reverse is true in small cities (under 25,000). Maternal cases among women of comparatively low income received the bulk of the visiting nursing service, especially in the large cities; rise with income in the proportion receiving bedside care from private-duty nurses obtains regardless of size of city or region of residence.

Colored women in urban communities.—(Residents of cities under 100,000 population except in the South and residents of the West were excluded.) Among colored women receipt of medical and nursing care varied widely according to size of city and region; in cities of 100,000 and more population in the Northeast, 72 percent were hospitalized and 3 percent were reported as receiving no medical care; in cities of 25,000 to 100,000 in the South, 8 percent were hospitalized and 59 percent received no medical care. By relief status, fluctuations were not so marked.

Comparisons of receipt of medical care by maternal cases among white and among colored women show that: (*a*) In relief families living in the large cities of the Northeast and North Central States, hospital care was received with somewhat greater frequency by the colored than by the white women, the cases reported as receiving no medical care comprising a somewhat smaller proportion of the colored; among nonrelief families in these cities, hospital care was received with greater frequency by white women. (*b*) In large cities in the South, among relief families white women received hospital care with greater frequency and there were relatively fewer cases not receiving medical care than among the colored; among the nonrelief families these

differences obtained but the variations were considerably more marked. (*c*) It is in the smaller cities of the South that the greatest inequalities in receipt of medical care are found. In cities of 25,000 to 100,000 about 60 percent of the maternal cases among the colored population were reported as receiving no medical care and only 8 percent were hospitalized in comparison with rates among the white of less than 5 percent receiving no medical care and around 40 to 60 percent receiving hospital care. In smaller cities there were also marked contrasts in receipt of medical care by the white and by the colored maternal cases.

Receipt of nursing care by all maternal cases among the white and among the colored women showed contrasts similar to those observed for medical care.

Women in selected rural areas.—Both medical and nursing care were received by women in the rural areas surveyed decidedly less frequently than among women in urban communities.

Prenatal and operative services.—Receipt of prenatal care by non-hospitalized cases manifests a close relation to economic status; this relation holds true for the total group of cases and for the various city-size groups. Moreover, on the average, pregnant women were under supervision for a longer time in cities with population of 100,000 and more and in those of less than 10,000 than in cities of intermediate size; women pregnant for the first time were also under supervision for a longer time, on the average, than those who had previously experienced pregnancy.

In cities under 25,000 population, the proportion of women receiving Wassermann examinations during pregnancy rose with income (non-hospitalized cases only), while the reverse was true in larger cities. The percentage of pregnant women receiving this service was lowest in cities of less than 10,000 population, about twice as high in cities of 10,000 to 100,000 as in the smaller cities, and about three times as high in cities of 100,000 and more. Receipt of Wassermann examinations appears to bear little relation to the amount of prenatal supervision received.

The relation between receipt of maternal services and economic status is strikingly apparent with respect to obstetric techniques employed during delivery. For each of the techniques studied (cesarean section, episiotomy, and forceps), a sharp rise with income is found in the proportion of cases in which the technique was employed.

COURT DECISION ON PUBLIC HEALTH

Mere possession of unwholesome poultry held not violative of sanitary code provision.—(New York Supreme Court, Appellate Division, Second Department; *People* v. *Swift & Co., Inc.*, 25 N.Y.S.2d 512; decided March 3, 1941.) The defendant company, a wholesale dealer in food, was convicted of a violation of section 163 of the Sanitary Code of New York City, which section, so far as material, provided: "No meat, * * * not being then healthy, fresh, sound, wholesome, or safe for human food * * * shall be brought into the city of New York or held, kept, offered for sale or sold as such food or kept or stored anywhere in the said city. * * * The term 'meat' as used herein shall include * * * fowl. * * *" It appeared that the defendant's procedure relative to poultry was as follows: Poultry was delivered to the defendant's storage room packed in boxes, each box containing 12 chickens and weighing approximately 45 pounds. After the classification of a shipment for size, quality, and color, 3 to 5 boxes of each classification were opened and the birds examined. If they appeared sound the covers were replaced and the lot placed in a cooler. When poultry was required on the sales floor 20 or 25 boxes were requisitioned from the cooler and 3 to 5 boxes were opened and the contents examined in the storage room for the second time. If they appeared to be sound the lot was sent to the sales room. Before the poultry was sold every box was opened in the presence of the customer and the contents again examined, this third examination being by both the defendant's salesman and the customer. Each bird was removed from the box only when "they look as if they are in any way off condition."

On a certain date 2 health department inspectors examined 20 boxes of a lot of between 100 and 125 boxes in the cooler. They found 22 chickens which concededly were unwholesome. The lower court held that the merchandise in the cooler was being kept for sale within the meaning of the sanitary code section and found the defendant guilty.

On appeal by the company the appellate court reversed the judgment, dismissed the information, and remitted the fine. The court cited a recent court of appeals case as authority for the proposition that possession alone, without intent to sell unwholesome food, was not a violation of the involved section and said that in its opinion the defendant made an honest effort to ascertain whether the poultry was unwholesome and did not intend to sell it if inspection disclosed that it was unsound.

DEATHS DURING WEEK ENDED APRIL 5, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 5, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,575	9,214
Average for 3 prior years	8,878	
Total deaths, first 14 weeks of year	132,285	133,297
Deaths under 1 year of age	470	546
Average for 3 prior years	523	
Deaths under 1 year of age, first 14 weeks of year	7,574	7,258
Data from industrial insurance companies.		
Policies in force	64,571,281	65,866,801
Number of death claims	12,661	13,926
Death claims per 1,000 policies in force, annual rate	10.2	11.1
Death claims per 1,000 policies, first 14 weeks of year, annual rate	10.8	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 12, 1941

Summary

Decreases were recorded during the current week for each of the 9 important communicable diseases included in the following table, with the exception of smallpox, for which the same number of cases (33) was reported for the two weeks. This figure is lower than that reported for any prior corresponding week.

The number of reported cases of measles decreased from 56,338 for the preceding week to 53,256, with the highest incidence rates still being recorded for the Middle Atlantic, East North Central, and South Atlantic States. The largest decrease for the current week was shown for the Middle Atlantic area, and this was more than sufficient to offset the slight increases in some of the other geographic areas.

A total of 435,181 cases of measles has been reported to date (first 15 weeks of the year), as compared with 488,032 cases for the corresponding period in 1938, the latest preceding "measles year." With the peak coming later during the current year, it appears likely that the final total for 1941 will exceed that for 1938.

The number of cases of meningococcus meningitis dropped from 70 for the preceding week to 48, and of poliomyelitis from 21 to 18. Six of the cases of poliomyelitis were reported in Florida (5 last week). Eight cases of meningococcus meningitis were reported in Mississippi, 6 in Pennsylvania, 5 in New York, and 4 in North Carolina.

Of 12 cases of Rocky Mountain spotted fever, 7 cases occurred in Montana, 3 in Oregon, and 2 in Wyoming.

One case of psittacosis was reported in Washington, D. C.[1]

The death rate for the current week for 93 major cities in the United States was 11.9 per 1,000 population, as compared with 12.0 for the preceding week and with a 3-year average (1938–40) of 12.2 for the corresponding week (88 cities).

[1] See p. 863.

Telegraphic morbidity reports from State health officers for the week ended April 12, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Apr. 12, 1941	Apr. 13, 1940		Apr. 12, 1941	Apr. 13, 1940		Apr. 12, 1941	Apr. 13, 1940		Apr. 12, 1941	Apr. 13, 1940	
NEW ENG.												
Maine	0	1	1	2	2	19	56	533	114	1	0	0
New Hampshire	0	0	0	2	------	------	58	93	29	0	0	0
Vermont	0	0	0	------	------	------	18	6	48	0	0	0
Massachusetts	3	6	6	------	------	------	921	604	714	2	0	2
Rhode Island	0	2	2	------	------	------	3	156	75	0	0	0
Connecticut	3	1	1	------	5	5	228	89	91	2	1	0
MID. ATL.												
New York	19	11	34	[1] 18	[1] 14	[1] 14	7,601	641	1,839	5	7	10
New Jersey	4	5	12	9	10	10	2,299	533	533	2	0	2
Pennsylvania	18	25	25	------	------	------	5,316	211	737	6	8	8
E. NO. CEN.												
Ohio	6	11	15	14	78	26	8,945	27	237	1	0	3
Indiana	13	2	9	7	24	24	1,301	5	26	0	0	2
Illinois	13	17	30	30	13	33	3,854	92	92	0	1	3
Michigan [2]	2	3	11	8	25	11	4,745	464	324	0	0	4
Wisconsin	1	0	3	89	134	60	1,622	463	463	1	0	1
W. NO. CEN.												
Minnesota	0	2	2	1	3	1	10	178	178	1	0	1
Iowa	3	9	9	84	9	9	309	370	196	1	0	0
Missouri	3	5	11	2	------	48	274	71	31	0	3	1
North Dakota	1	3	1	7	28	22	7	10	10	0	0	0
South Dakota	0	3	2	------	------	------	2	9	0	0	0	0
Nebraska	0	0	1	------	------	------	17	24	67	0	0	0
Kansas	2	4	4	6	21	21	1,328	597	47	0	2	1
SO. ATL.												
Delaware	0	0	0	------	------	------	282	1	13	0	0	0
Maryland [2 3]	1	1	2	14	11	11	215	8	247	3	1	1
Dist. of Col. [4]	3	2	4	1	------	1	341	3	68	0	0	1
Virginia	3	13	10	229	328	328	1,862	102	486	2	2	4
West Virginia	5	10	9	38	59	59	637	18	53	0	4	6
North Carolina [3]	6	12	12	[2] 3184	14	43	1,776	177	248	4	0	2
South Carolina	10	11	4	408	442	429	804	27	41	0	0	0
Georgia [3]	7	10	8	92	94	201	787	89	89	1	0	1
Florida [3]	5	3	4	185	7	7	1,099	127	95	0	0	3
E. SO. CEN.										0		
Kentucky	4	2	9	4	10	34	1,784	93	93	2	0	5
Tennessee	4	4	6	87	96	154	647	145	69	1	1	1
Alabama [3]	8	9	10	119	142	365	639	144	134	8	4	4
Mississippi [2 3]	4	5	5	------	------	------	------	------	------		1	1
W. SO. CEN.												
Arkansas	8	7	5	168	99	99	390	24	24	0	0	1
Louisiana	5	9	9	20	25	26	167	5	15	0	1	1
Oklahoma	6	5	7	58	171	171	136	18	61	0	1	2
Texas [3]	36	17	33	1,232	641	646	1,127	882	535	3	0	2
MOUNTAIN												
Montana [5]	1	1	1	1	12	12	74	23	16	0	0	0
Idaho	0	3	1	1	5	5	4	52	39	0	0	0
Wyoming [5]	0	2	0	------	------	------	58	29	29	0	0	0
Colorado	12	12	10	19	23	------	375	25	25	1	0	1
New Mexico	1	4	3	6	------	4	260	29	35	0	1	1
Arizona	4	1	2	101	93	93	53	53	53	0	0	0
Utah [2]	0	0	0	6	7	------	21	636	110	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	0	0	3	------	1	110	763	378	0	0	0
Oregon [5]	3	5	2	10	11	44	354	642	70	0	0	0
California [5]	13	14	16	304	186	186	340	455	541	1	1	1
Total	241	272	397	3,439	2,842	3,201	53,256	9,746	11,559	48	39	69
15 weeks	4,358	5,485	7,637	576,751	155,283	129,527	435,181	95,996	128,696	742	[6] 614	1,296

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 12, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Apr. 12, 1941	Apr. 13, 1940		Apr. 12, 1941	Apr. 13, 1940		Apr. 12, 1941	Apr. 13, 1940		Apr. 12, 1941	Apr. 13, 1940	
NEW ENG.												
Maine	0	0	0	15	13	15	0	0	0	1	0	1
New Hampshire	0	0	0	5	7	7	0	0	0	1	0	0
Vermont	0	0	0	25	3	9	0	0	0	0	0	0
Massachusetts	1	0	0	206	187	308	0	0	0	0	0	0
Rhode Island	0	0	0	5	12	18	0	0	0	0	0	0
Connecticut	0	0	0	64	97	102	0	0	0	3	3	0
MID. ATL.												
New York	1	1	1	727	998	998	0	0	0	4	5	5
New Jersey	0	0	0	220	435	214	0	0	0	1	3	2
Pennsylvania	0	0	0	420	482	482	0	0	0	6	6	6
E. NO. CEN.												
Ohio	0	1	0	296	310	389	1	1	2	0	4	4
Indiana	0	0	0	137	162	172	0	0	14	0	5	2
Illinois	0	0	1	426	773	773	3	0	10	2	1	4
Michigan [2]	0	1	0	306	373	474	0	0	3	4	0	2
Wisconsin	1	0	0	116	123	175	3	2	3	1	2	
W. NO. CEN.												
Minnesota	0	0	0	48	29	113	0	3	4	0	1	0
Iowa	1	0	0	53	78	204	3	19	47	1	1	1
Missouri	0	0	0	109	41	167	6	3	23	0	1	2
North Dakota	0	0	0	4	7	16	0	0	5	0	1	1
South Dakota	0	0	0	13	17	23	0	2	9	0	0	0
Nebraska	0	0	0	26	15	36	0	0	8	0	0	0
Kansas	1	0	0	41	52	153	1	0	37	0	2	1
SO. ATL.												
Delaware	0	0	0	19	5	10	0	0	0	0	0	0
Maryland [2,3]	1	0	0	25	35	50	0	0	0	1	1	1
Dist. of Col.[4]	0	0	0	18	25	21	0	0	0	3	0	1
Virginia	0	0	0	32	39	29	0	0	0	1	3	3
West Virginia	0	2	1	71	66	39	1	0	0	1	1	1
North Carolina [3]	1	0	0	21	28	28	2	0	0	8	0	2
South Carolina	0	0	0	6	0	3	1	0	0	3	2	2
Georgia [3]	0	0	0	15	12	12	0	0	0	3	4	3
Florida [3]	6	0	0	2	4	6	0	0	0	2	0	3
E. SO. CEN.												
Kentucky	1	0	0	167	79	57	0	0	2	3	5	5
Tennessee	1	1	1	104	80	28	0	6	1	0	4	4
Alabama [3]	0	0	0	11	15	12	0	1	0	1	3	2
Mississippi [2,3]	0	1	1	10	7	6	0	2	0	1	1	1
W. SO. CEN.												
Arkansas	0	0	0	8	4	3	6	3	1	0	4	1
Louisiana	0	0	0	5	7	12	1	0	0	0	3	6
Oklahoma	0	0	0	10	33	33	0	0	7	0	2	1
Texas [3]	2	0	1	63	25	118	3	5	11	5	2	13
MOUNTAIN												
Montana [5]	0	0	0	41	30	30	0	0	9	0	2	0
Idaho	0	0	0	3	16	16	0	1	3	0	1	0
Wyoming [5]	0	0	0	12	4	7	0	0	2	0	2	0
Colorado	0	0	0	26	44	43	0	18	6	0	3	0
New Mexico	1	0	0	8	16	16	0	0	0	0	1	1
Arizona	0	0	0	7	6	11	0	0	0	0	1	1
Utah [3]	0	1	0	7	15	21	0	0	0	1	0	0
Nevada	0	------	------	4	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	1	0	14	44	39	0	0	6	3	1	1
Oregon [5]	0	0	0	13	14	35	2	1	4	2	0	1
California [3]	0	2	3	124	129	192	0	5	18	2	4	4
Total	18	11	14	4,108	4,995	5,690	33	72	306	64	85	98
15 weeks	390	388	307	55,778	71,706	90,774	671	1,075	4,698	1,125	1,165	1,644

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 12, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— Apr. 12, 1941	Whooping cough, Week ended— Apr. 13, 1940
NEW ENG.		
Maine	43	38
New Hampshire	4	20
Vermont	9	28
Massachusetts	158	175
Rhode Island	21	5
Connecticut	40	24
MID. ATL.		
New York	283	440
New Jersey	69	99
Pennsylvania	348	357
E. NO. CEN.		
Ohio	426	174
Indiana	23	41
Illinois	76	114
Michigan [2]	330	137
Wisconsin	88	91
W. NO. CEN.		
Minnesota	83	30
Iowa	65	9
Missouri	40	7
North Dakota	25	12
South Dakota	30	2
Nebraska	30	8
Kansas	115	50
SO. ATL.		
Delaware	4	2
Maryland [2] [3]	64	180
Dist. of Col. [4]	18	10
Virginia	148	38
West Virginia	44	49
North Carolina [3]	312	106
South Carolina	129	21
Georgia [3]	61	14
Florida [3]	13	19

Division and State	Whooping cough, Week ended— Apr. 12, 1941	Whooping cough, Week ended— Apr. 13, 1940
E. SO. CEN.		
Kentucky	40	115
Tennessee	48	55
Alabama [3]	48	31
Mississippi [2] [3]		
W. SO. CEN.		
Arkansas	12	24
Louisiana	9	43
Oklahoma	25	20
Texas [3]	339	386
MOUNTAIN		
Montana [5]	24	3
Idaho	17	15
Wyoming [5]	0	3
Colorado	108	22
New Mexico	29	45
Arizona	21	37
Utah [2]	69	119
Nevada	4	
PACIFIC		
Washington	63	55
Oregon [5]	19	39
California [3]	445	305
Total	4,419	3,617
15 weeks	65,057	44,968

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Apr. 12, 1941, 25 cases as follows: Maryland, 1; North Carolina, 1; Georgia, 8; Florida, 2; Alabama, 4; Mississippi, 1; Texas, 7; California, 1.
[4] Psittacosis, week ended Apr. 12, 1941, Dist. of Col., 1 case.
[5] Rocky Mt. spotted fever, week ended Apr. 12, 1941, 12 cases as follows: Montana, 7; Wyoming, 2; Oregon, 3.
[6] Delayed reports of 16 cases in New York City included.

PSITTACOSIS IN WASHINGTON, D. C.

Report has been received of the occurrence of a case of psittacosis, with onset April 7, 1941, in an employee in the birdhouse of the National Zoological Park in Washington, D. C.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 29, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose ing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	120	429	97	5,773	776	2,192	24	385	19	1,168	
Current week [1]	50	343	43	20,159	494	1,490	0	334	14	1,213	
Maine:											
Portland	0	1	0	0	4	1	0	1	0	19	25
New Hampshire:											
Concord	0		0	0	0	0	0	0	0	0	9
Manchester	0		0	0	0	2	0	0	0	0	24
Nashua	0		0	0	0	0	0	0	0	0	7
Vermont:											
Barre											
Burlington	0		0	0	0	0	0	0	0	0	10
Rutland	0		0	0	1	0	0	1	0	0	4
Massachusetts:											
Boston	1		0	304	11	73	0	10	0	47	234
Fall River	0		0	0	1	4	0	1	0	7	27
Springfield	0		0	4	0	7	0	2	0	8	36
Worcester	0		0	52	8	8	0	2	0	1	80
Rhode Island:											
Pawtucket	0		0	0	0	1	0	0	1	0	15
Providence	0	1	1	5	3	5	0	1	0	19	69
Connecticut:											
Bridgeport	0		2	1	2	5	0	1	0	2	37
Hartford	0	3	0	1	2	9	0	0	0	0	40
New Haven	0	2	1	0	3	21	0	1	0	11	41
New York:											
Buffalo	0		0	100	5	46	0	3	0	10	125
New York	13	28	6	6,666	100	318	0	78	5	85	1,623
Rochester	0		1	81	3	7	0	1	0	12	74
Syracuse	0		0	0	2	3	0	1	0	21	54
New Jersey:											
Camden	0	1	1	24	4	18	0	1	0	1	30
Newark	0	5	0	236	6	40	0	10	0	17	123
Trenton	0	1	0	50	2	57	0	3	0	0	36
Pennsylvania:											
Philadelphia	2	3	2	1,589	29	106	0	19	0	54	534
Pittsburgh	0		0	406	11	15	0	8	0	51	180
Reading	0		0	195	2	0	0	0	0	6	25
Scranton	0			1		2	0		0	2	
Ohio:											
Cincinnati	0	4	2	681	4	16	0	8	0	2	141
Cleveland	1	8	2	2,760	13	37	0	9	0	77	200
Columbus	0	2	2	145	4	17	0	1	1	14	95
Toledo	0		0	79	4	6	0	3	0	14	72
Indiana:											
Anderson	0		0	6	1	1	0	0	0	1	4
Fort Wayne	0		0	68	5	1	0	1	0	0	36
Indianapolis	5		1	406	9	19	0	4	0	9	99
Muncie	0		0	33	0	15	0	1	0	0	7
South Bend	0		0	26	4	0	0	0	0	0	26
Terre Haute	0		0	4	1	0	0	0	0	0	29
Illinois:											
Alton	0		0	1	1	3	0	0	0	0	10
Chicago	7	7	3	1,818	22	189	0	32	2	41	675
Elgin	0		0	289	1	0	0	0	0	0	11
Springfield	0		0	3	1	11	0	0	0	2	31
Michigan:											
Detroit	3	3	0	1,211	12	155	0	15	0	137	240
Flint	0		0	168	3	4	0	0	0	15	32
Grand Rapids	0		0	568	0	7	0	1	0	6	37
Wisconsin:											
Kenosha	0		0	148	1	0	0	0	0	2	7
Madison	0		0	61	1	7	0	0	0	2	9
Milwaukee	0	1	0	196	6	36	0	5	0	23	104
Racine	0		0	5	0	6	0	0	0	6	19
Superior	0		0	0	0	1	0	0	0	0	11

[1] Figures for Barre estimated: report not received.

City reports for week ended March 29, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0		0	1	3	0	0	0	0	22	29
Minneapolis	0	1	1	4	5	13	0	2	0	40	127
St. Paul	0		0	2	6	10	0	2	0	12	56
Iowa:											
Cedar Rapids	0			0		1	0		0	0	
Davenport	0			4		3	0		0	0	
Des Moines	3			2		6	0		0	3	25
Sioux City	0			0		3	0		0	2	
Waterloo	0			23		3	0		0	2	
Missouri:											
Kansas City	0		3	33	3	12	0	0	0	33	73
St. Joseph	0		0	20	5	0	0	0	0	1	30
St. Louis	1		0	152	21	68	0	13	1	22	218
North Dakota:											
Fargo	0		0	0	1	0	0	0	0	19	12
Grand Forks	0			0		0	0		0	0	
Minot	0			0		0	0		0	4	6
South Dakota:											
Aberdeen	0			0		2	0		0	2	
Nebraska:											
Lincoln	0			3		6	0		0	0	
Omaha	0		0	1	3	1	0	1	0	0	46
Kansas:											
Lawrence	0		0	22	2	0	0	0	0	5	9
Topeka	0		0	184	3	3	0	1	0	7	22
Wichita	0		0	0	6	0	0	0	0	11	27
Delaware:											
Wilmington	0		0	95	4	2	0	0	0	0	26
Maryland:											
Baltimore	0	12	0	90	19	24	0	10	0	57	249
Cumberland	0		0	1	0	1	0	0	0	0	13
Frederick	0		0	0	1	2	0	0	0	2	4
Dist. of Col.:											
Washington	2	3	1	276	20	14	0	7	2	6	166
Virginia:											
Lynchburg	0		1	9	2	2	0	0	0	0	11
Norfolk	1	19	0	399	2	1	0	2	1	2	21
Richmond	0		0	52	4	2	0	3	0	0	59
Roanoke	2		0	116	1	0	0	0	0	2	16
West Virginia:											
Charleston	0		0	23	5	0	0	1	0	1	41
Wheeling	0		0	9	0	2	0	0	0	9	16
North Carolina:											
Gastonia	0			33		0	0		0	11	
Raleigh	0		0	340	0	1	0	0	0	23	11
Wilmington	0		0	1	2	0	0	2	0	3	15
Winston-Salem	0	2	0	23	3	0	0	0	0	9	22
South Carolina:											
Charleston	0	23	0	42	4	0	0	0	1	1	22
Florence	0	19	0	10	2	0	0	0	0	2	12
Georgia:											
Atlanta	0	7	1	104	7	1	0	4	0	1	86
Brunswick	0		0	13	0	0	0	0	0	0	4
Savannah	0	19	2	24	4	1	0	1	0	0	47
Florida:											
Miami	0	7	1	32	0	1	0	2	1	0	44
Tampa	0	1	1	0	1	0	0	0	0	2	25
Kentucky:											
Ashland	0		0	0	1	1	0	0	0	0	8
Covington	0		0	44	0	2	0	1	0	0	15
Lexington	0		0	7	4	0	0	0	0	0	15
Tennessee:											
Knoxville	0		0	77	0	13	0	1	0	5	25
Memphis	0	6	0	67	0	4	0	3	0	4	63
Nashville	0		1	90	1	10	0	2	0	0	45
Alabama:											
Birmingham	0	8	2	111	7	2	0	3	1	4	678
Mobile	0	6	1	12	0	0	0	0	0	1	20
Montgomery	0	2		15		1	0		0	0	
Arkansas:											
Fort Smith	0			13		0	0		2	0	
Little Rock	1	10	1	13	2	2	0	0	0	10	38
Louisiana:											
Lake Charles	0		0	0	0	0	0	0	0	0	2
New Orleans	1	4	2	22	12	1	0	11	0	3	136
Shreveport	0		0	2	1	0	0	7	0	0	52

City reports for week ended March 29, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	1	0	------	0	2	4	0	2	0	0	51
Tulsa	0	0	------	14	1	2	0	0	0	8	16
Texas:											
Dallas	0	------	0	35	7	0	0	1	0	2	63
Fort Worth	0	------	2	97	2	4	0	0	0	7	48
Galveston	0	------	0	0	1	0	0	1	0	0	17
Houston	3	2	0	1	10	3	0	2	0	0	106
San Antonio	0	4	1	1	9	0	0	5	0	1	57
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	6
Great Falls	0	------	0	1	0	4	0	0	0	0	5
Helena	0	------	0	2	0	4	0	0	0	0	2
Missoula	0	------	0	0	1	0	0	0	0	0	7
Idaho:											
Boise	0	------	0	4	0	1	0	0	0	0	8
Colorado:											
Colorado Springs	0	------	0	3	0	3	0	1	0	5	12
Denver	5	24	0	181	3	4	0	5	0	44	67
Pueblo	0	------	1	2	2	0	0	0	0	8	6
New Mexico:											
Albuquerque	0	------	0	16	0	0	0	5	0	4	12
Utah:											
Salt Lake City	0	------	0	8	4	5	0	0	0	22	37
Washington:											
Seattle	0	------	0	0	0	0	0	3	0	12	76
Spokane	0	------	0	10	0	3	0	0	0	0	35
Tacoma	0	------	0	3	2	0	0	0	0	9	32
Oregon:											
Portland	0	2	0	21	7	2	0	2	0	1	90
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	2	23	1	43	6	33	0	16	0	44	356
Sacramento	0	2	0	9	0	6	0	2	1	14	37
San Francisco	1	116	------	6	10	7	0	7	0	47	162

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Maryland:			
Springfield	1	0	0	Frederick	1	0	0
New York:				North Carolina:			
New York	2	2	0	Wilmington	1	0	0
Pennsylvania:				Alabama:			
Philadelphia	1	1	0	Birmingham	1	0	0
Michigan:				Louisiana:			
Flint	1	0	0	Shreveport	0	3	0
Missouri:				California:			
St. Louis	1	0	0	Los Angeles	0	1	1

Encephalitis, epidemic or lethargic.—Cases: Newark, 1; Chicago, 1; Florence, 1. Deaths: Boston, 1.

Pellagra.—Cases: Philadelphia, 1; Columbus, 1; Wichita, 1; Charleston, South Carolina, 1; Tampa, 1; Knoxville, 1; Mobile, 1; New Orleans, 1.

Typhus fever.—Cases: Montgomery, 1.

Rabies in man.—Deaths: St. Louis, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 8, 1941.—During the week ended March 8, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	13	2	5	16	1		1	7	46
Chickenpox		17	1	185	294	16	27	18	74	632
Diphtheria	2	15	3	29	2					51
Dysentery				15	1					16
Influenza		13			9	5			31	58
Measles		392	197	395	1,200	125	246	263	1,141	3,959
Mumps				272	271	38	23	81	40	675
Pneumonia		19			12	2	5		7	45
Scarlet fever		23	7	125	248	4	6	22	30	465
Tuberculosis		13	7	79	54	4	8	1		166
Typhoid and paratyphoid fever				16	1	1	2			20
Whooping cough				132	148	1	10	1	25	317

Vital statistics—Third quarter 1940.—The Bureau of Statistics of Canada has published the following preliminary statistics for the third quarter of 1940. The rates are computed on an annual basis. There were 22.0 live births per 1,000 population during the third quarter of 1940 as compared with 20.8 for the third quarter of 1939. The death rate was 8.7 per 1,000 population for the third quarter of 1940 and 8.5 for the same quarter of 1939. The infant mortality rate was 46 per 1,000 live births in this quarter as compared with 53 for the corresponding quarter of 1939. The maternal death rate was 3.4 per 1,000 live births for the third quarter of 1940, and 3.6 for the same quarter of 1939.

The accompanying tables give the numbers of births, deaths, and marriages, by Provinces, for the third quarter of 1940, and deaths by causes in Canada for the third quarter of 1940 and the corresponding quarter of 1939.

Number of births, deaths, and marriages, third quarter, 1940

Province	Live births	Deaths (exclusive of stillbirths)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada [1]	63, 242	25, 155	2, 883	218	44, 606
Prince Edward Island	525	210	21	1	233
Nova Scotia	3, 189	1, 277	143	7	2, 171
New Brunswick	2, 944	1, 039	197	11	1, 794
Quebec	21, 257	7, 536	1, 246	86	14, 386
Ontario	17, 899	8, 798	635	64	14, 518
Manitoba	4, 043	1, 536	176	12	3, 073
Saskatchewan	5, 261	1, 425	187	15	2, 070
Alberta	4, 415	1, 379	166	16	2, 873
British Columbia	3, 709	1, 955	112	6	3, 488

[1] Exclusive of Yukon and the Northwest Territories.

Deaths, by cause, third quarter, 1940

Cause of death	Canada [1] (third quarter)		Province								
	1939	1940	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
All causes	24, 161	25, 155	210	1, 277	1, 039	7, 536	8, 798	1, 536	1, 425	1, 379	1, 955
Automobile accidents	531	627	3	32	22	171	272	31	22	32	42
Cancer	3, 102	3, 314	25	186	139	870	1, 220	217	164	181	312
Cerebral hemorrhage, cerebral embolism and thrombosis	435	529	12	52	38	118	193	34	25	26	31
Diarrhea and enteritis	1, 023	637	9	9	84	349	83	27	36	23	17
Diphtheria	68	38	-------	1	2	18	4	-------	11	2	-------
Diseases of the arteries	2, 326	2, 505	18	109	73	489	1, 235	157	112	116	196
Diseases of the heart	3, 984	4, 525	35	223	152	1, 066	1, 909	271	241	230	398
Homicides	39	50	1	3	-------	12	17	4	2	5	6
Influenza	188	194	1	14	7	67	52	12	11	16	14
Measles	28	21	-------	1	-------	8	5	2	3	1	1
Nephritis	1, 383	1, 527	12	60	39	766	397	53	72	47	81
Pneumonia	800	888	9	40	34	249	322	74	48	45	67
Poliomyelitis	24	16	-------	-------	-------	6	6	2	1	-------	1
Puerperal causes	213	218	1	7	11	86	64	12	15	16	6
Scarlet fever	17	15	-------	-------	-------	6	5	2	1	1	-------
Suicides	258	245	-------	7	6	38	74	16	36	37	31
Tuberculosis	1, 406	1, 426	11	98	60	612	252	96	58	85	154
Typhoid fever	48	62	-------	-------	5	35	10	2	4	2	4
Other violent deaths	1, 434	1, 425	10	70	50	383	511	74	98	96	133
Other specified causes	-------	6, 621	59	345	282	2, 073	2, 144	432	439	392	455
Unspecified or ill-defined causes	-------	120	8	12	18	41	10	9	11	10	6
Whooping cough	112	152	1	8	17	73	13	9	15	16	-------

[1] Exclusive of Yukon and the Northwest Territories.

FINLAND

Notifiable diseases—4 weeks ended January 31, 1941.—During the 4 weeks ended January 31, 1941, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	260	Poliomyelitis	12
Dysentery	3	Scarlet fever	478
Influenza	7, 514	Typhoid fever	81
Paratyphoid fever	187	Undulant fever	8

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of March 28, 1941, pages 674-678. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Smallpox

Syria.—During the week ended March 1, 1941, 1 case of smallpox was reported in the interior of Syria.

Public Health Reports

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IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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RECENT DEVELOPMENTS RELATING TO PUBLIC HEALTH INTEREST IN HOUSING[1]

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During recent months increasing emphasis has been placed on housing as a matter of concern to health authorities. This emphasis has arisen partly from the growing recognition of the importance to the defense program of adequate healthful housing in areas undergoing population expansion. There is, however, strong evidence that attention is also being given to longer-range considerations. The purpose of this article is briefly to summarize for the past year significant developments in the field of housing as related to public health interest.[2]

At the annual conference of the State and Territorial Health Officers with the United States Public Health Service, in April 1940, the Surgeon General said:

> It is becoming increasingly apparent that health officers must turn their attention to stronger assistance in the solution of another age-old and basic health problem—the problem of inadequate housing. Programs now being carried on under recent housing legislation have made a real beginning in the amelioration of conditions of substandard housing. The health departments have a tremendous stake in these programs both from the standpoint of physical as well as mental health benefits that may be expected to derive from improvement in housing conditions.

A special conference of State and Territorial Health Officers with the United States Public Health Service convened in September to consider public health problems arising out of national defense (*1*). The conference gave considerable time to discussion of the problem of inadequate housing in areas of industrial and military concentration and the strain on sanitary facilities resulting from a rapid increase in

[1] From the Division of Public Health Methods, National Institute of Health.

[2] This review covers only information that has been readily available to the United States Public Health Service. The Public Health Service will be glad to be informed of any similar developments which have occurred during the year in State and local areas. Communications should be addressed to the Division of Public Health Methods, National Institute of Health, United States Public Health Service, Bethesda, Md.

population in these areas. Among the recommendations made by the Committee on Public Health in Areas of Mobilization, to which the subject was referred, were the following:

That minimum requirements for environmental sanitation and communicable disease control be formulated by the United States Public Health Service for the guidance of State and local health authorities in the mobilization areas.

That coordination of activities pertaining to housing, industrial hygiene, and sanitation be immediately effected by the United States Public Health Service with existing governmental and nonofficial agencies, in order that State and local health authorities may be aided in establishing proper measures for the protection of the health of the civil population in areas affected by national defense measures.

In conformance with the first of these recommendations, the Sanitation Section of the Domestic Quarantine Division has prepared a tentative sanitation code, part of which deals with the sanitation of habitable buildings. A preliminary draft of the code has been released to secure comments and suggestions for revision, as well as to determine how it fits in with existing regulations. The objective of the code is to suggest procedures by which health departments may correct many of our environmental problems, especially those created in national defense areas. In connection with the second recommendation, the Public Health Service has carried out special reconnaissance surveys in extra-military and defense industrial areas to determine health and medical care needs in these areas. One part of these surveys relates to housing conditions and needs.

The United States Public Health Service has always given considerable attention to health and sanitation problems associated with unsatisfactory housing conditions. As part of their regular functions, two units of the Public Health Service—the Sanitation Section of the Domestic Quarantine Division and the Division of Public Health Methods of the National Institute of Health—are continuously working with problems in this field.

The Sanitation Section, whose sanitation code has been mentioned, normally concerns itself with the sanitation aspects of housing as part of its work in the whole field of community and environmental sanitation.

The Division of Public Health Methods of the National Institute of Health, in its work with housing, is interested primarily in studying the current administrative practices of local health departments in the control of health hazards associated with housing. Illness and accident data from the National Health Survey have also been analyzed in relation to housing characteristics (*2*). At the request of the United States Housing Authority, a member of the staff of the Division has been serving in liaison capacity with the Authority to assist in resolving matters in its program which have a health impli-

cation. These cover a broad field, including standards for healthful housing, problems of home and environmental sanitation, physiological and sociological effects of adequate housing, community facilities with particular reference to health centers, and procedures relating to cooperative practices between housing and health authorities.

In April 1940, the Milbank Memorial Fund held its 18th Annual Conference, at which the fundamental human needs—food and shelter—were discussed, together with the population trends which will affect these needs in coming decades. At one of the round-table meetings, held in conjunction with the Committee on the Hygiene of Housing of the American Public Health Association, the closing discussions on the opportunities and responsibilities of public health administrators in the field of housing indicated very clearly the growing tendency to regard it as of basic importance in a broad program of expanding public health objectives.

The American Public Health Association at its annual meeting in Detroit on October 8–11, 1940, set up a committee on housing in the Health Officers' Section. A panel discussion, "How Far Should Housing Concern the Health Officer," preceded the establishment of this committee and inquired into the responsibilities the health officer should assume in assuring healthful housing to his community. The committee, under the chairmanship of Dr. Huntington Williams, Commissioner of Health, Baltimore, Md., will function as a clearing house for reports and advice on health department activities relative to housing conditions in local areas. The Committee will also attempt to show how remedial action related to slums and demolition of substandard dwellings can become part of the normal function of the health officer.

Recently the National Organization for Public Health Nursing has created a housing committee to serve in a consultant capacity to the organization and keep it informed about housing developments throughout the country with particular reference to the health implications of housing projects. This action was taken by the Board of Directors of the National Organization for Public Health Nursing in January 1940, and interest in the subject was evident at the Biennial Convention in Philadelphia, May 12–17, 1940, at which Dr. C.-E. A. Winslow presented a paper on housing and health, emphasizing nursing activities (*3*). All sections of the country are represented on the committee.

Increasing interest at the State level in the public health aspects of housing is evidenced by recent actions taken in Texas and Connecticut. The Texas Public Health Association passed the following resolution at its annual meeting (Fort Worth, Oct. 1–3, 1940):

Whereas the Texas Public Health Association recognizes the improvement in living conditions and consequently in the health levels of numerous groups of the

population being brought about through programs of the several agencies concerned directly with the improvement in housing conditions; and

Whereas these programs would be greatly implemented through a positive public health program designed to supplement the efforts of the housing authorities; now

Therefore be it Resolved, That the Texas Public Health Association recommend that a Unit be set up in the State Health Department to survey the public health aspects of housing throughout the State with a view of providing consultant services to local health departments.

(a) Establishing a definite State public health policy in regard to housing improvement;

(b) Development of a long-range program for dealing comprehensively with the public health aspects of housing;

(c) Organization of cooperative programs with housing agencies in the various localities of the State.

Another significant development is the appointment in the Connecticut State Health Department of a housing engineer whose function will be to study housing conditions in the communities of the State, to review critically the structure and administration of existing local and State regulations, to investigate the adequacy of inspectional services affecting housing, and to work with local officials on a general housing education program. The position has been established with the aid of funds available to the State under Title VI of the Social Security Act. The Committee on the Hygiene of Housing will serve in a consulting capacity in connection with this work.

Connecticut thus has taken a leading step toward meeting the increasing demands being made on both State and local health agencies to participate actively in a concerted movement to bring the national housing structure up to an adequate level. Such action, together with the other evidences of interest cited, indicates something of the extent to which improvement of conditions of substandard housing is coming more definitely to be regarded as a public health responsibility.

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(*2*) Britten, Rollo H., Brown, J. E., and Altman, Isidore: Certain characteristics of urban housing and their relation to illness and accidents: Summary of the findings of the National Health Survey. The Milbank Memorial Fund Quarterly, **18**: 91 (1940).

(*3*) Winslow, C.-E. A.: Housing and health. Public Health Nursing, **32**: 434 (1940).

PREVALENCE OF POLIOMYELITIS IN THE UNITED STATES IN 1940

By C. C. Dauer, M. D., *Epidemiologist, District of Columbia Health Department*

In 1940 the number of cases of poliomyelitis reported in the United States increased by about 30 percent over the number in 1939. The total of 9,770 cases [1] in 1940 has been exceeded only four times since 1915. In 1916 there were 27,363 cases reported from 27 States, in 1927 there were 10,533 from 48 States, in 1931 15,790 from 43 States, and in 1935 10,839 cases from the entire country. However, it must be borne in mind that there have been changes in the criteria for diagnosis of poliomyelitis and that reporting of the disease was probably more accurate in 1940 than in 1916 or 1927. In each of the four years mentioned the disease occurred mainly in the thickly populated eastern seaboard States, while in 1940 it was found principally in the north central part of the country.

The distribution of poliomyelitis in 1939 was characterized by a series of small localized outbreaks in different sections of the country in addition to a fairly widespread occurrence in the southern Rocky Mountain region. In 1940, as shown in the accompanying map (fig. 1), the disease occurred in epidemic form in several large areas in the north central section and northwestern or northern Rocky Mountain section of the country. In several instances the larger epidemic areas in 1940 were in the same regions in which the smaller localized outbreaks had occurred in 1939.

Michigan reported the largest number of cases (1,241) in 1940, which was also the largest number ever reported in that State. Iowa had a greater number of cases per 100,000 population, 937 cases being reported, or a case rate of 36.9. Indiana reported 682 cases (case rate 19.9), and West Virginia 662 cases (case rate 34.8). Other States reporting a large number of cases were: Ohio (656), Illinois (600), Kansas (542), Wisconsin (494), California (466), Washington (428), and Missouri (316). Table 1 shows that three States had case rates of 30 or more per 100,000 population, two had rates between 20 and 30, and eight had case rates between 10 and 20. Throughout the entire country there were 28 counties in which the case rate per 100,000 population was in excess of 100. In 1939 only 13 counties had rates of 100 or more. These data indicate a fairly high rate of incidence in certain sections of the country.

As in previous reports (*1*) the numbers of cases by counties used in preparing the map for 1940 were the total of those reported monthly by individual States to the Public Health Service. Case rates were calculated according to the populations of the 1940 Census.

[1] Numbers of cases and case rates for 1940 throughout this report are provisional.

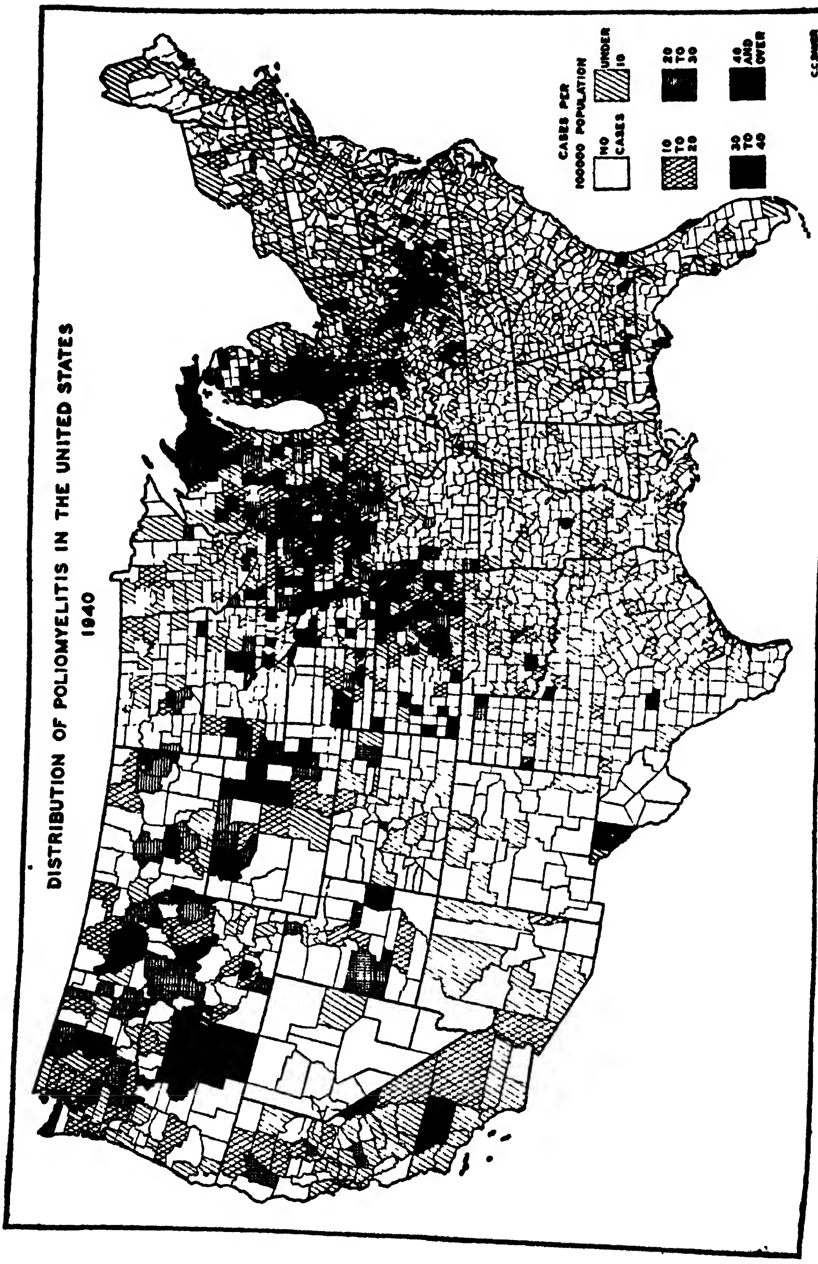
DISTRIBUTION OF POLIOMYELITIS IN THE UNITED STATES
1940
CASES PER
100000 POPULATION
NO CASES
UNDER 10
10 TO 20
20 TO 30
30 TO 40
40 AND OVER

FIGURE 1.

TABLE 1.—*Poliomyelitis case rates per 100,000 population by States, 1935–1940*

	1935	1936	1937	1938	1939	1940
United States	8.6	8.5	7.3	1.3	5.6	7.4
New England:						
Maine	19.0	5.0	16.1	1.7	.5	1.3
New Hampshire	9.5	.8	4.9	.2	.8	.4
Vermont	17.7	2.1	7.6	2.3	8.4	1.7
Massachusetts	32.0	1.3	7.9	.4	1.7	1.0
Rhode Island	51.5	.7	3.2	.9	.4	1.2
Connecticut	23.4	.9	6.2	1.2	1.6	1.1
Middle Atlantic:						
New York	22.2	1.5	4.9	1.1	8.0	1.6
New Jersey	11.8	.6	3.6	.9	5.3	1.5
Pennsylvania	2.2	1.3	3.3	.8	4.2	1.7
East North Central:						
Ohio	1.3	5.1	7.9	.8	2.3	9.5
Indiana	1.4	1.5	4.2	.4	1.6	19.9
Illinois	3.0	8.8	9.9	1.4	2.4	7.6
Michigan	13.0	3.2	9.0	1.2	19.1	23.0
Wisconsin	2.2	1.5	11.4	1.7	3.8	15.7
West North Central:						
Minnesota	3.6	1.2	12.6	1.6	20.5	8.4
Iowa	2.5	3.0	9.4	1.5	7.7	36.9
Missouri	1.3	2.7	9.9	.6	.7	8.3
North Dakota	1.7	2.7	.9	1.1	1.9	3.9
South Dakota	2.1	1.9	5.7	4.0	3.6	12.7
Nebraska	.9	1.7	16.0	.7	3.6	14.0
Kansas	1.5	5.0	12.9	.6	2.3	30.1
South Atlantic:						
Delaware	2.0	.4	3.1	.8	3.1	.8
Maryland	6.4	2.2	4.8	1.0	1.6	.9
District of Columbia	14.3	1.1	4.8	4.3	3.0	1.2
Virginia	25.7	2.2	2.4	2.0	1.8	9.3
West Virginia	2.2	3.4	3.7	.8	3.5	34.8
North Carolina	19.8	1.5	3.1	1.4	3.3	2.1
South Carolina	2.1	1.2	1.2	1.4	23.8	1.0
Georgia	.8	4.8	2.7	1.9	3.1	.9
Florida	1.0	2.5	1.8	1.8	4.0	1.7
East South Central:						
Kentucky	11.5	3.1	4.4	1.3	5.9	7.8
Tennessee	3.2	13.2	4.4	1.1	1.1	1.9
Alabama	2.1	14.6	2.9	3.4	1.5	1.9
Mississippi	.8	9.5	21.0	3.4	1.3	2.0
West South Central:						
Arkansas	.8	2.7	16.2	1.6	2.4	1.5
Louisiana	4.8	1.6	6.2	2.0	.9	5.5
Oklahoma	.5	5.0	18.1	1.1	2.2	4.9
Texas	1.3	1.1	10.7	1.0	3.8	2.7
Mountain						
Montana	1.1	2.6	5.8	2.6	1.1	19.1
Idaho	.9	4.3	3.9	2.4	7.2	13.0
Wyoming	.9	3.0	16.7	.4	3.5	16.3
Colorado	2.1	6.3	19.4	1.3	13.0	3.5
New Mexico	2.4	7.4	6.1	2.6	26.1	4.3
Arizona	6.1	3.4	6.8	2.2	22.4	1.4
Utah	2.1	1.3	6.4	.8	19.0	11.3
Nevada	2.0	2.0	5.0	.0	2.0	1.0
Pacific.						
Washington	2.4	4.7	5.3	1.1	1.7	24.6
Oregon	4.6	3.6	6.0	1.5	5.2	5.8
California	13.7	6.4	11.5	2.2	16.6	6.7

There were five distinct areas in the north central part of the United States where epidemics of poliomyelitis occurred. The center of one such area was located in western West Virginia, which area also included a number of counties in southern Ohio, eastern Kentucky, and southwestern Virginia. Another area was composed of a large group of counties in northern Indiana and the western part of the lower peninsula of Michigan. The upper or northern peninsula of Michigan and northern Wisconsin formed another epidemic area. Nearly all of the State of Iowa, a few counties in southern Minnesota, west central Illinois, and eastern South Dakota were the location for

another epidemic. The fifth area included the eastern half of Kansas, western Missouri, and some of Nebraska. The incidence of the disease was also high in Wyoming, Montana, Idaho, Washington, Oregon, and Utah but in these States the counties with high rates (40 or more per 100,000 population) were more scattered, except in eastern Oregon and adjoining counties in Idaho, in eastern Wyoming, and in Montana. In the northwest section of the country a comparatively large proportion of the counties reported only a few cases each but because of small populations the case rates were high.

The incidence of poliomyelitis in the area comprising the upper peninsula of Michigan and northern Wisconsin was higher than in any other section of the country. The 15 counties of the upper peninsula of Michigan, which constitute 4.5 percent of the total population of the State, reported 358 of the 1,241 cases, or 29 percent of the total for Michigan in 1940. The case rate for the group of 15 counties was 111.5 per 100,000 population. Luce County (population 7,406) reported the largest number, according to the monthly reports, 85 cases or a rate of 1,148, which means more than one in every 100 inhabitants were attacked.[2] An adjoining county, Alger, reported 35 cases, or a rate of 346. Two counties in Wisconsin bordering on Michigan also had excessively high rates of incidence. Vilas County reported 19 cases and Florence County 16, case rates of 245 and 381, respectively. From 1929 to 1939, inclusive, the group of 15 counties in upper Michigan reported comparatively few cases except in 1931 when 51 were recorded. However, 25 of the 51 cases occurred in Houghton County. The average number reported from this group of counties for the years from 1932 to 1939, inclusive, was about 6 cases per year. Thus the interval between epidemics was about 8 years in some of the counties.

Although the case rate for the State of Iowa was higher than for the whole State of Michigan, the epidemic in the former was not as severe as that in the upper peninsula of Michigan. Six counties in Iowa had rates ranging from 100 to 175 per 100,000 population and a considerable number ranged between 40 and 100. In the remainder of the epidemic areas in the north central region the average case rate was somewhat lower than in the Iowa area. Only two counties in Indiana and four in lower Michigan had rates of 100 or more, while there were three counties in Kansas, one in Ohio, and two in West Virginia with

[2] According to a statement in a personal communication to the author from the District Health Officer, Dr. A. C. Orr, there were 96 cases of poliomyelitis in Luce County in 1940, 63 paralytic and 33 nonparalytic, with 7 deaths registered. In the village of Newberry (population 2,732) there were 51 cases, or a case rate of 1,866 per 100,000 population (almost 2 percent of the population). Several of the townships had almost as high rates; in one the cases were concentrated along the main highway. The age distribution of the cases in the county was not unusual. No cases were discovered among vacationers, campers, or transients. Twenty-two families had multiple cases. It was stated that the disease appeared to spread in the same manner as typhoid fever, and that in Newberry food stands seemed to play some part in the spread of the disease.

rates in excess of 100. The greatest number of cases in any one county in the northwest or northern Rocky Mountain region occurred in Pierce County, Washington. From this county 205 cases were reported (case rate 116.5), 108 in the city of Tacoma (case rate 100.4), and 97 cases from the remainder of the county (case rate 142.4).

In addition to collecting data on poliomyelitis by counties a tabulation of cases reported weekly by States has been kept by the author. Study of these two groups of data reveals a point of unusual interest. It was pointed out in the report for 1939 that the peak of incidence in several States was reached much later in the fall than usual. This happened in Iowa, Kentucky, West Virginia, and Wisconsin. In each of these States there were small groups of counties in which a comparatively large number of cases occurred late in the season, i. e., in November and December 1939 and even in January 1940. In the late winter and spring months of 1940 poliomyelitis was not reported in larger numbers than one would expect, but in the following summer the disease again appeared in epidemic form in certain of these counties and in the area surrounding them. Several counties in eastern Kentucky and western West Virginia, which had a high incidence in the fall of 1939, appear to have been the focus from which the infection spread to the surrounding area in the summer of 1940. Likewise the small group of counties in Iowa which reported poliomyelitis in larger numbers than usual in the fall and winter of 1939–40, appear to have been the center from which the epidemic in that area may have spread the following summer. Several counties in northern Wisconsin reported a number of cases late in the fall of 1939 and a considerable number in January and February of 1940. In the summer of 1940 the disease began to appear first in the area comprising these counties and immediately afterward in the counties of the upper peninsula of Michigan.

Such occurrences as described above are not unusual, since several similar instances are to be found in the past decade. Even earlier the winter outbreak occurring in Elkins, West Virginia, may be cited (*2*). Late in November 1916 an epidemic of poliomyelitis began in Elkins which reached its peak in December and subsided in January 1917. Two other towns nearby also had outbreaks of the disease in January and February of that year. During the summer of 1917 a more widespread outbreak occurred in the nearby counties and in several counties of Virginia, Maryland, Pennsylvania, and Ohio. Caverly (*3*) described an outbreak of the disease in Vermont in the summer of 1917. He believed that the 6 cases occurring in March 1917 in the town of Waterbury were connected with a severe epidemic in surrounding towns of Washington County later in the summer.

Late in the fall of 1933 and in January 1934 cases of poliomyelitis were reported in larger numbers than usual in the State of Washington

(see table 2 showing cases reported by weeks). A severe outbreak followed in the summer of 1934. In the summer of 1936 few cases of poliomyelitis were reported from the States of Arkansas and Oklahoma but late in the fall and early winter a fairly large number of cases occurred, principally in a group of adjoining counties in western Arkansas and eastern Oklahoma.[3] This was followed by a more widespread outbreak in the summer of 1937 involving a large number of counties in these two States and in neighboring areas. In November 1938 several cases of poliomyelitis were reported in Charleston, S. C., and sporadic cases continued to occur during the next two months.

TABLE 2.—*Number of cases reported by weeks in Washington, Arkansas, Oklahoma, and South Carolina*

Week	Washington			Arkansas			Oklahoma			South Carolina		
	Median 1928-32	1933	1934	Median 1931-35	1936	1937	Median 1931-35	1936	1937	Median 1933-37	1938	1939
1	0	1	0	0	0	1	0	1	1	0	0	0
2	0	1	5	0	0	1	1	0	2	1	0	0
3	1	0	5	0	0	1	0	0	2	0	0	2
4	1	0	2	0	0	2	0	0	1	0	0	1
5	0	0	1	0	0	2	0	0	0	0	0	3
6	0	0	0	0	0	3	0	1	1	0	2	0
7	1	0	0	0	0	3	0	0	1	0	0	2
8	0	1	0	0	0	0	0	1	2	0	0	0
9	1	1	0	0	1	0	0	1	0	0	0	0
10	0	0	3	0	0	1	0	1	0	0	0	1
11	0	0	1	0	1	0	0	0	1	0	0	0
12	0	0	1	0	0	0	0	0	1	0	0	4
13	0	1	1	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0	0	5
15	0	3	1	0	0	0	0	0	0	0	0	8
16	0	0	0	0	0	0	0	0	0	0	0	6
17	0	0	1	0	1	0	0	0	0	0	0	8
18	0	1	0	0	0	2	0	0	3	0	3	13
19	0	2	0	1	0	0	0	0	1	0	0	22
20	0	0	1	0	1	0	0	0	0	0	0	28
21	0	1	0	0	0	0	1	0	0	0	0	22
22	1	0	1	0	0	1	0	0	0	0	0	22
23	0	1	0	0	0	4	0	0	3	0	0	27
24	1	0	2	0	0	3	0	0	1	0	0	28
25	0	0	2	0	0	7	0	0	8	1	0	30
26	0	0	1	0	0	26	1	0	7	0	0	29
27	1	0	2	0	0	36	0	1	55	0	0	20
28	1	0	8	0	0	36	0	0	46	1	0	20
29	1	1	12	0	0	48	0	0	53	0	1	12
30	0	0	34	0	0	26	0	0	28	1	0	12
31	1	1	41	0	0	21	0	0	30	1	2	17
32	1	0	45	0	0	19	0	0	23	2	0	14
33	1	2	70	1	0	10	0	0	19	0	2	15
34	0	2	42	0	1	7	0	1	25	1	0	16
35	1	3	50	1	0	6	0	0	9	1	1	6
36	4	3	42	1	1	12	1	0	14	1	0	12
37	1	11	61	0	0	9	0	1	19	0	2	5
38	1	4	71	1	1	12	1	1	13	0	0	8
39	4	14	25	0	1	13	1	0	21	0	1	5
40	3	5	47	0	0	7	1	2	15	0	1	8
41	3	4	39	0	1	3	0	0	10	0	1	11
42	4	6	25	0	9	8	0	0	2	1	0	0
43	4	3	25	0	4	7	0	2	3	0	0	1
44	2	3	14	1	4	1	0	6	2	0	0	1
45	2	4	16	1	8	3	1	31	1	1	0	4
46	1	5	4	0	7	3	0	25	1	0	0	1
47	2	2	7	0	5	8	1	17	0	1	2	1
48	2	0	9	0	1	0	0	11	2	0	0	0
49	3	3	3	0	2	1	0	4	1	1	2	4
50	2	4	8	0	4	0	1	3	1	0	0	0
51	1	------	6	0	3	2	0	4	2	0	8	0
52	1	2	0	0	1	0	0	3	0	0	3	0

[3] See Public Health Reports, vol. 53, June 24, 1938, pages 1016-1017 (maps 4 and 5).

Table 2.—*Number of cases reported by weeks in Wisconsin, Iowa, West Virginia, and Virginia*—Continued

Week	Wisconsin			Iowa			West Virginia			Virginia	
	Median 1934-38	1939	1940	Median 1934-38	1939	1940	Median 1934-38	1939	1940	Median 1935-39	1940
1	1	0	6	0	0	3	0	0	0	0	0
2	0	1	1	0	0	2	0	0	1	0	2
3	0	0	0	0	0	1	1	0	0	0	0
4	1	0	0	0	0	6	0	2	2	0	0
5	0	0	1	0	0	1	0	1	0	0	0
6	0	0	1	0	0	4	1	0	0	0	0
7	1	0	3	0	0	1	0	2	1	0	0
8	0	0	5	0	0	1	0	0	2	0	2
9	0	0	3	0	0	0	0	2	0	0	0
10	0	0	4	0	0	0	0	0	1	1	0
11	0	1	1	0	0	0	0	0	0	0	0
12	0	0	1	1	0	0	0	0	1	0	1
13	0	0	0	0	0	1	0	0	1	0	0
14	0	0	1	0	0	0	0	1	1	0	1
15	0	0	0	0	0	0	0	1	2	0	0
16	0	0	0	0	1	1	0	0	1	0	0
17	0	1	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	1	0
19	1	0	1	0	0	0	0	0	2	0	0
20	0	0	0	1	0	1	0	0	1	0	0
21	1	0	0	0	0	0	0	1	0	0	0
22	0	1	0	1	0	1	1	0	0	0	0
23	0	0	0	0	0	1	0	0	1	0	0
24	0	0	0	0	0	0	0	0	0	1	0
25	1	0	0	0	0	1	0	0	1	2	2
26	1	0	5	0	0	4	1	0	0	2	1
27	1	0	1	0	0	1	1	0	2	2	2
28	1	2	1	0	0	5	2	0	2	1	1
29	0	0	5	1	0	6	0	2	4	2	2
30	1	0	1	0	0	2	1	0	6	3	3
31	2	0	0	1	3	9	0	0	13	4	1
32	1	3	0	0	1	19	2	0	20	2	5
33	2	0	2	1	0	25	3	0	31	2	9
34	3	6	12	2	1	73	4	0	46	2	6
35	8	7	19	2	2	56	3	2	41	4	7
36	6	5	30	4	2	80	3	1	51	4	17
37	8	2	31	4	12	100	4	0	48	3	16
38	4	6	27	4	5	121	3	2	66	4	22
39	6	8	40	3	16	101	2	0	64	3	24
40	6	10	36	3	14	70	4	3	48	1	20
41	7	9	25	3	12	75	1	2	37	1	15
42	3	7	29	2	12	55	1	3	37	1	16
43	1	3	52	7	17	48	1	1	31	2	12
44	3	3	36	3	21	21	1	10	25	2	12
45	1	5	23	2	23	12	0	4	13	1	13
46	1	5	11	2	12	6	0	7	19	0	5
47	1	7	18	2	5	6	0	3	18	1	7
48	0	3	17	1	10	6	1	4	10	1	12
49	1	3	17	0	9	4	0	0	5	1	9
50	0	1	13	1	12	3	0	1	3	0	4
51	0	3	10	0	4	2	0	6	3	1	5
52	0	0	5	0	3	2	0	3	1	0	3

In April 1939 a severe outbreak began in Charleston which later involved a number of nearby counties. The occurrence of the cases in the fall and winter led the health officer of Charleston to predict the epidemic which followed.

Thus there appears to be evidence indicating that when there is an increased prevalence of poliomyelitis in the late fall and early winter, particularly in small localized areas, a more widespread epidemic will follow in the same general region during the summer immediately following. All outbreaks occurring in the summer do not exhibit these premonitory signs; as a matter of fact only a comparatively few do. However, these localized outbreaks occurring late in the fall and

in winter should be studied in more detail and followed carefully. If it can be shown in which general area certain outbreaks of poliomyelitis may be expected there would be opportunities to carry on valuable preliminary studies on the epidemiology and immunology of the disease. It would also be possible to study more advantageously the effect of a preventive measure if such can be devised.

In connection with the above observations it is a matter of interest to note that in the State of Virginia poliomyelitis cases were reported in larger numbers than usual during the months of November and December 1940. Most of these late cases were reported from counties located in the southwestern part of the State. It will be interesting to see whether this instance of occurrence of the disease in this locality in the late fall will be the forerunner of a more widespread outbreak in Virginia and the surrounding area in the summer of 1941.

Comparatively few contributions on the epidemiology of poliomyelitis appeared in the medical literature in 1940. However, in the laboratory the isolation of the virus from stools has been continued and the procedure has been simplified by nasal instillation of fecal suspensions in monkeys (*4*). This procedure of isolating virus undoubtedly will prove to be an effective tool in epidemiological studies, but up to the present time it has not been proved that sewage is an important source of infection either during epidemic or inter-epidemic periods. One study (*5*) reported the failure of chlorine in concentrations greater than that used to disinfect drinking water to inactivate the virus when an emulsion of infected monkey cord was mixed with tap water. This failure to inactivate virus is far from conclusive and does not indicate that the poliomyelitis virus is transmitted through the medium of drinking water. Under actual field conditions the following factors would have to be taken into consideration before considering water an important transmitting medium: Dilution, oxidation, action of sunlight, filtration through artificial filters and soil, effect of chemicals other than chlorine, and also storage.

A report (*6*) on serum-virus protection tests, using human serum from two areas where the disease had been epidemic and the Lansing strain of virus, seemed to indicate that mice could be used with consistent and trustworthy results. A wider application of this protection test using mice should prove a valuable aid in epidemiological studies, particularly so since other investigators (*7*) suggest that "aside from the neutralization test, the hope for a specific immunologic reaction for poliomyelitis is somewhat remote."

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A PRELIMINARY SURVEY OF THE ANOPHELINE MOSQUITO FAUNA OF SOUTHEASTERN MINNESOTA AND ADJACENT WISCONSIN AREAS [1]

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Despite common belief that malaria does not occur in Minnesota and Wisconsin it is well known to those in touch with the situation that locally acquired cases occasionally present themselves. There is current an impression that such cases are on the increase since the installation of the dams for improvement of navigation along the Mississippi River. The increasing number of cases of the disease reported to the Minnesota and Wisconsin State Health Departments would seem to afford some evidence in support of this view.

There were reported in Minnesota for the three seasons 1935–1937, inclusive, a total of 19 cases, of which 7 were clearly indigenous and 2 others presumably so. In 1938 there were 8 reported cases, of which 3 were indigenous. In 1939 there were recorded 22 cases. Parallel conditions prevailed in Wisconsin where a total of 20 cases was reported for the three seasons 1935–1937, of which 12 were indigenous.

[1] This paper embodies partial results of a cooperative study made by the Minnesota and Wisconsin State Health Departments with the aid of the U. S. Public Health Service, covering the period August 25–September 26, 1939.

Associated in the work were Harold Peters, H. Laurence Burdick, and Robert Dicke, without whose efficient aid the scope of the work would have been greatly restricted. Acknowledgments are also due Theodore Olson, biologist of the Minnesota State Department of Health, who kept in close touch with the studies and who made numerous photographs illustrating typical breeding places, as did Mr. Peters.

In 1938 there were 7 cases reported, of which 5, occurring in cities bordering the Mississippi River, were indigenous. The number of cases reported in 1939 reached 28.

Four species of anophelines, each a potential malaria carrier, occur in Minnesota. These are *Anopheles maculipennis*, *A. punctipennis*, *A. quadrimaculatus*, and *A. walkeri*. Data regarding their incidence and distribution are few, as compared with those relating to other insects of economic importance. In view of the awakened interest in malaria, Dr. A. J. Chesley, secretary and executive officer of the Minnesota State Board of Health, in August 1939, suggested to Dr. C. A. Harper, State health officer of Wisconsin, that an intensive survey be made of the anopheline fauna along the Mississippi River, on both sides, from Wabasha, Minn., to La Crosse, Wis. Late as the season was, it was evident that important data relative to the incidence and breeding habits of the various species might still be obtained.

The project and the necessary expenditures of Federal funds were promptly approved and equipment assembled. On August 26 a general survey of the area under consideration (see fig. 1) was made to determine the most favorable location for the field laboratory. Ready access to a bridge, to boats, and to typical flooded areas on both sides of the Mississippi led to the selection of Wabasha, Minn., as headquarters for both the Minnesota and the Wisconsin field workers. A cabin adjacent to a considerable swampy area was available and intensive work was begun on August 27.

METHODS OF WORK

Insofar as the limited time permitted, four main lines of work were carried out:

1. Building collections were made over as many scattered localities in the area as was feasible. Regardless of species, mosquitoes resting in sheds, privies, bathhouses, basements, and similar shelters were collected by the use of an aspirator. Search was also made beneath bridges and culverts. The total collections were counted and the anophelines identified.
2. Collection of anophelines attacking the workers was carried out to only a limited degree.
3. Light trap catches, utilizing the available two, and for part of the time three, of the well-known New Jersey electrically controlled mosquito traps, were made during the entire period of the survey.
4. Larval collections were particularly emphasized, with a view to determining the extent of favorable breeding places. To insure correct identifications the specimens were usually bred out.

The survey was most fortunate in securing, through the courtesy of the District Engineer, U. S. War Department, a set of the maps pre-

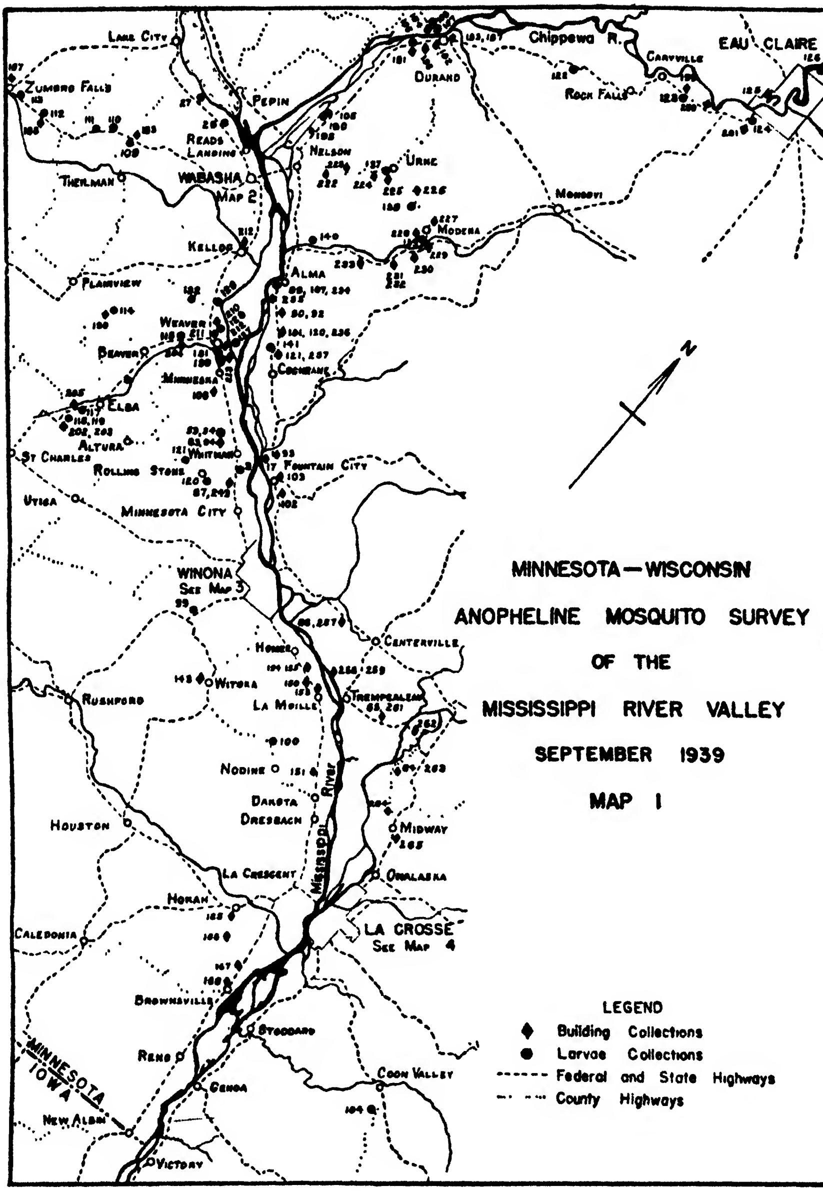

FIGURE 1.—The survey area.

pared in connection with the river improvement project. These consisted of key maps to the various regions in the valley as well as a number of detailed maps showing areas of marsh, open water, flood plain forest, streams, etc., on a large scale. Although various changes have occurred in the course of completion of the dams, the maps were invaluable aids for the field studies.

Records of temperature and other weather conditions were kept throughout the work. These and other details will be filed for future reference and additions.

September weather in Minnesota is very undependable and the group was fortunate in having a full month, August 27 to September 27, of practically uninterrupted field work. According to the Weather Bureau monthly summary the mean temperature for September was 69.1° F., a departure of +6.6°.

COLLECTIONS FROM BUILDINGS AND OTHER SHELTERS

In the course of the work, mosquitoes were taken from many kinds of diurnal resting places. These included privies, basements, sheds, bathhouses, bridges, culverts, cattle underpasses, and other shelters. All resting mosquitoes, including the nonanophelines, were collected from as many different localities in the area as time permitted. Of the 12,321 specimens thus secured, 11,798, or 95.7 percent, were anophelines.

As illustrative of the conditions in buildings, exclusive of other shelters, we may consider the results at Wabasha, where collections were made daily in the basement of the field laboratory and in each of three privies near the laboratory.

For the period August 27–September 26, 1939, there were 4,853 mosquitoes collected from these four stations. Of the total only 79, or 1.6 percent, were nonanophelines.

There were 4,774 anophelines, or 98.4 percent of the total catch. These were distributed as follows:

	Number	*Percent*
Anopheles quadrimaculatus	4, 500	94. 4
A. punctipennis	262	5. 4
A. walkeri	12	0. 2
A. maculipennis	—	—

The enormous preponderance of *A. quadrimaculatus* in building collections was clearly indicated from the outset but was quite at variance with such distribution records as were available in the entomological collections of the University of Minnesota. Such records indicated a probable greater incidence of *A. punctipennis* in southeastern Minnesota. As we shall see, this was due to the fact that most of the previous collections had been made at points not on the Mississippi.

Examination of the detailed report of collections shows that there was a daily influx of anophelines and particularly of *quadrimaculatus* into these buildings. Even though removed daily, large numbers were always present the following morning. Thus, on the morning of September 3, 243 specimens were captured in the basement, although it had been cleared carefully the day before. On September 16, 231 specimens of *quadrimaculatus* were collected from one of the privies.

The picture is essentially the same when the total collections of 11,191 mosquitoes from buildings and other resting places throughout the river valley area are considered. The anophelines constituted 95.9 percent of the catch and of these *quadrimaculatus* represented 91.7 percent.

A significant contrast is afforded by the collections made in the surrounding hills and valleys, outside of the river valley proper. In these localities, referred to in subsequent discussion as "inland," there were taken 1,130 adult specimens from resting places comparable to those searched in the river valley. Again the anophelines were dominant, being represented by 1,070 specimens, or 94.7 percent. The distribution of species was strikingly different from that found in the river valley. *Punctipennis* led with 917 specimens, or 85.7 percent, while *quadrimaculatus* was represented by only 151, or 14.1 percent, as compared with the total of 94.7 percent found in the river valley collections from similar shelters. *A. walkeri* and *A. maculipennis* were each represented by a single specimen.

These findings agree with previous records indicating that *punctipennis* is the most common widely distributed anopheline in southern Minnesota. It breeds by preference in spring-fed streams and pools among the hills of this region, a fact which is in agreement with the known habits of the species.

While there is ample evidence to support the view that *quadrimaculatus* is the chief carrier of malaria in the southern United States, there should be further investigation before it is concluded that it plays an equally important role in Minnesota. As bearing on this question it should be noted that most of the dwelling houses in the area are well screened and that *walkeri*, also an efficient carrier, readily attacks man in the open, even in mid-day, in bright sunlight.

ANOPHELINES CAUGHT WHILE ATTACKING

Throughout the survey specimens of anophelines feeding on man in the open were collected. Unfortunately time did not permit extensive collecting of this type and the following data represent occasional catches during the course of other work. On three occasions a definite attempt was made to obtain feeding records.

Of the total catch of 134 mosquitoes, *quadrimaculatus* supplied 16, or 11.9 percent. *A. walkeri* was represented by 114, or 85.1 percent, *punctipennis* by 4, or 3 percent, and no specimens of *maculipennis* were taken.

Of the 114 *walkeri*, 55 were collected when a definite effort was made to obtain feeding records. These collections were made on 3 successive days.

Obviously the data on feeding habits are so meager as to be merely suggestive. However, the preponderance of *walkeri* was also noted in similar catches of feeding mosquitoes made by William Chalgren, in 1938, in the Minneapolis–St. Paul area. Of 4,166 specimens, representing 21 species, *walkeri* was the only anopheline, and 47 specimens of it were taken. The relative frequency with which it occurred in trap catches also indicates that it may be more important than ordinarily has been considered.

LIGHT TRAP CATCHES

Three electrically controlled mosquito traps of the New Jersey type, which has become standard for mosquito survey work, were available and two of them were in use for the entire period at Wabasha. The third was operated for a 5-day period at La Crosse, Wis.

Of those in use at Wabasha, trap A was suspended in an apple tree close to the laboratory, on a ridge overlooking an extensive mosquito-breeding swamp (fig. 2). Trap C was located in a back yard in the residential district known as West Wabasha.

From trap A 15,804 mosquitoes were taken during the period August 26 to September 25 (table 1). Of these, 3,482, or 22 percent, were anophelines, the percentage in the daily catches ranging from 4 on August 29, to a high of 51.4 on September 18. The total daily catch as well as the percentage of anophelines varied. On two occasions no mosquitoes were collected. This occurred on September 23 and again on September 25, when the light trap studies were concluded because of cold weather.

The largest single catch occurred on the night of September 15 when 2,264 mosquitoes were collected. Of these, 740, or 30.6 percent, were anophelines. This record catch was made at the hottest period of the survey, a situation noted by other workers using light traps in sampling mosquito populations in other regions. Examination of the humidity records did not show any definite effects due to variations in this factor.

TABLE 1.—*Summary of light trap catches at Wabasha, Minn., August 26–September 25, 1939*

	Trap A		Trap C		Traps A and C	
	Number	Percent	Number	Percent	Number	Percent
Anopheles quadrimaculatus	632	18.2	1,061	74.4	1,693	34.5
Anopheles punctipennis	493	14.1	130	9.1	623	12.7
Anopheles walkeri	2,357	67.7	234	16.4	2,591	52.8
Anopheles maculipennis	------	------	1	------	1	------
Total anophelines	3,482	100.0	1,426	100.0	4,908	100.0
Total anophelines	3,482	22.0	1,426	21.3	4,908	28.1
Total nonanophelines	12,322	78.0	5,272	78.7	17,594	71.9
Total	15,804	100.0	6,698	100.0	22,502	100.0

FIGURE 2.—Trap A and a portion of the extensive swampy area below the laboratory at Wabasha, Minn. (Photograph by Harold Peters.)

FIGURE 3.—Backwater area with algal mats in which anophelines were breeding in numbers, near the field laboratory. (Photograph by Theodore Olson.)

In considering the distribution of the species captured by trap A, the preponderance of *walkeri*, which is generally referred to in literature as an uncommon species, is striking. In the course of the month during which this trap was operated 2,357 specimens of *walkeri*, or 67.7 percent of the total anophelines, were taken as contrasted with 632, or 18.2 percent, of *quadrimaculatus*. It is the more striking in view of the fact that the trap was hung in the location where such large collections of *quadrimaculatus* were made in buildings. That it was not due to failure of the traps to attract the latter is evident when it is noted that the condition was almost completely reversed with trap C where 74.4 percent were *quadrimaculatus* and only 16.4 percent were *walkeri*. When the catches of the two traps are combined it is seen that a little over half of the anophelines were *walkeri*, about one-third *quadrimaculatus*, and an eighth *punctipennis*.

Trap C, instead of hanging in the open near the edge of an extensive breeding place, as was trap A, was in a yard with crowded shrubbery, in a residential district. The total number of mosquitoes caught here during the period was 6,698, as compared with 15,804 at trap A. It is interesting to find that the percentages of anophelines were almost identical—22 for trap A and 21.3 for trap C.

In the absence of more complete data it is difficult to explain these differences in the catches from the two traps located only 2 miles apart. They were identical in construction and light bulbs of the same intensity were used. Breeding conditions for anophelines were more favorable in the surroundings of trap A, but also existed more remotely within range of trap C. That *quadrimaculatus* was present in abundance in the former locality is shown by the fact that 4,500 specimens were collected from the basement and the three outbuildings routinely inspected. Unfortunately only meager indoor collections were made in the region of C and hence comparisons between the two areas in this respect are not possible.

The discrepancies in the performance of the two traps serve to emphasize a fact well known to workers accustomed to their use, that it is not safe to rely on one or two traps to give a true picture of the mosquito fauna of a region. Care must be taken to select different significant locations or to select comparable areas if information concerning relative breeding is sought.

While more extensive collections from buildings might have cleared up the discrepancies in the data relative to catches of *quadrimaculatus*, there remains the more puzzling question as to the reason for the great numbers of *walkeri* taken with trap A as compared with those from trap C. Earlier studies had convinced us that the species is common in Minnesota and that it feeds readily in the open at any time of day.

That *walkeri* is not a household mosquito is indicated by the fact that only 12 specimens were included in the routine collections from buildings at Wabasha. It seems probable that it does not penetrate into residential districts as readily as does *quadrimaculatus* or is more restricted in its flight from breeding places. However, the fact that *walkeri* may overwinter in the egg stage (*3*, *7*) might account for its being less attracted to houses during the period covered by this survey.

Light trap collections in the Minneapolis–St. Paul area, as well as our experience with trap A, suggest that *walkeri* may more readily be attracted to lights than are the other anophelines in this region. Johnson (*4*) found that from 15 to 50 percent of the anophelines caught by a light trap at Reelfoot Lake, Tenn., were of this species, although it was very scarce in collections from buildings and in the larval surveys.

It is evident that further studies of the biology, distribution, and incidence of *A. walkeri* are highly desirable, particularly since it is known to be capable of transmitting both *Plasmodium vivax* (experiments of Matheson, Boyd, and Stratman-Thomas (*6*) and *Plasmodium falciparum* (experiments of Kitchen and Bradley (*5*)). Recently Bang, Quinby, and Simpson (*1*) reported finding a wild-caught specimen harboring malarial parasites. The salivary glands were heavily infected and 6 oocysts were found on the stomach.

The above-discussed light trap data relate to conditions at Wabasha, Minn., where the two traps were run throughout the entire period, August 26–September 25. A third trap of the same type was operated at La Crosse, Wis., for the 5-day period September 12–16, when larval surveys and building collections were being made in the vicinity. The trap was located on the edge of the main channel of the Mississippi River, on La Plume Island. A total of 1,751 mosquitos was collected here, less than that of either of the Wabasha traps for the same period. Of these, *walkeri* was by far the most abundant anopheline, constituting 84.7 percent of the 483 taken, while *quadrimaculatus* made up 15.1 percent. A single specimen of *punctipennis* was included in the catch.

For purposes of comparison the catches of the La Crosse and the two Wabasha traps for the same 5-day period are given in table 2. Since the La Crosse trap was in a position somewhat similar to that of trap A at Wabasha, the catches of the two might be expected to be comparable. The percentages of *quadrimaculatus* were almost identical. *Punctipennis*, with its single representative, was practically lacking in the La Crosse catch, while *walkeri* was even more predominant than in trap A at Wabasha.

TABLE 2.—*A comparison of the light trap catches at La Crosse and at Wabasha for the 5-day period September 12–16, 1939*

	La Crosse		Wabasha			
			Trap A		Trap C	
	Number	Percent	Number	Percent	Number	Percent
Anopheles quadrimaculatus	73	15.1	290	16.6	478	75.8
Anopheles punctipennis	1	.2	249	14.3	43	6 8
Anopheles walkeri	409	84.7	1,206	69.1	110	17.4
Anopheles maculipennis						
Total anophelines	483	100 0	1,745	100 0	631	100.0
Total anophelines	483	27.6	1,745	35.4	631	26 6
Total nonanophelines	1,268	72.4	3,191	64.6	1,740	73 4
Total	1,751	100.0	4,936	100.0	2,371	100.0

In view of this close agreement it is apparent that the anopheline populations at the two extremes of the surveyed area are very much alike. It is believed from these and supplementary studies that the entire valley between these points would yield similar results if the mosquito populations were similarly sampled.

LARVAL SURVEY

Most of the actual time for the month of the survey was spent in the field locating important anopheline breeding places. The surveys were more or less centered at Wabasha, Reads Landing, Winona, and La Crosse, which, as seen by the map, afforded typical conditions for the river valley. Some collections were made at additional points of interest and 2 days were devoted to inland surveys, away from the valley proper.

A total of 102 collections of anopheline larvae were made in the river valley, the larvae being taken to the laboratory and usually reared. No mosquitoes were reared from 13 of the collections, in most of which the anophelines were not abundant and such as were present were in early instars. From the other 89 collections numerous adults were recovered. Detailed records were kept as to the stations studied, the typical vegetation, the amount of shade or exposure, presence of fish, and other significant data. These and the field notes are on file and will serve as a basis for more extended work in the future.

The anopheline larvae were generally found in clean, quiet waters with abundant vegetation. Sloughs, sluggish streams, impounded waters behind wing dams, and similar situations all through the surveyed area were favored breeding places. Dense tangled thickets of submerged *Ceratophyllum*, *Myriophyllum*, and occasionally of *Potamogeton* with algal mats of *Spirogyra* and, more often, of *Hydro-*

dictyon (fig. 3) were particularly favored by *quadrimaculatus* and *punctipennis*. The duckweeds *Lemna* and *Wolffia* were often scattered over these areas, but when they were present in thick, almost solid layers, the larvae were not present in numbers. As was to be expected, situations where vegetation was not abundant, and where the water was deeper and accessible to fish, yielded few anopheline larvae.

All four species were obtained in these larval collections. Of a total of 948 reared, 544, or 57.4 percent, were *quadrimaculatus*. *Punctipennis* was second with a total of 366 reared adults, or 38.6 percent. *Walkeri* was represented by only 37 reared adults, or 3.9 percent, and *maculipennis* by a single one.

From these data, obviously very meager and based on restricted seasonal collecting, it would appear that *quadrimaculatus* and *punctipennis* are the most common two anophelines breeding in the sloughs and impounded waters in the valley. Of the 89 larval collections, 34 yielded adults of both species, while 20 yielded only *punctipennis* and 22 *quadrimaculatus*. It should be pointed out that only 1 or 2 adults were reared from many of these latter samples.

How this condition compares with that which existed before the installation of the dams cannot accurately be determined. The whole area was swampy and subject to overflow, and afforded many favorable breeding places, especially for *quadrimaculatus*. However, much of the swamp was covered by trees which were removed in the course of the river improvement program and this exposure to light rendered it more attractive to the anophelines. It is highly probable that there is greatly increased breeding by *quadrimaculatus* in the river valley.

Relative to *walkeri* there are a number of puzzling questions which can be answered only by further detailed studies. As we have seen, it was by a very wide margin the dominant species taken in light trap A and at La Crosse, both of which traps were located near marshy breeding areas and not in a residential district as was trap C. It was also the species most frequently taken while attacking man. Why was it so meagerly represented (3.9 percent) in the larval collections?

The most obvious answer to this question would appear to be that the particular breeding places favored by *walkeri* were overlooked in the larval survey. This may be the case although the larval survey was most intense in the Wabasha area and particularly in the area from which trap A attracted mosquitoes. It seems improbable that any important concentrated breeding area of *walkeri* would be overlooked, especially when all types were being examined here from the beginning of the survey. Another possibility is that the favorable breeding period for *walkeri* had passed before the survey began. Of this we have no evidence beyond indications that the species overwinters in the egg stage in the north.

Such limited data as are at present available suggest that *walkeri* favors flooded grassy areas in shallow water for breeding. These areas were, on some occasions, cut grass, but probably included sedges and rushes as well. In most cases these stations were rated as poor because larvae were not abundant. However, these grassy areas do cover large extents of bottom land and even though *walkeri* larvae are sparsely scattered over them, the total emergence might be very great.

If this proves to be the breeding habit of *walkeri*, it affords one explanation of why the species was obtained so infrequently in the larval survey. With the time strictly limited, the area to be examined very extensive, and the possibility of weather conditions limiting the survey, each collecting stop was brief and if no larvae or only a very few were found, the collectors moved on to another station. This resulted in emphasis on areas where larvae were concentrated. Thus, if *walkeri* does not breed in concentrated areas as do *quadrimaculatus* and *punctipennis* it would very likely be missed.

This may also account for difficulties experienced by others in locating the breeding places of this species. Bradley and McNeel (*2*), in Florida, and Johnson (*4*), in Tennessee, found *walkeri* readily attracted to light traps but also had great difficulty in locating breeding places. Johnson reared only 1 adult from all nearby breeding places, while Bradley collected only 8 larvae.

In order to learn how extensively the four species of anophelines occurred elsewhere in the general region, 2 days were spent in a survey away from the river valley. The topography of these areas of southeastern Minnesota and corresponding sections of Wisconsin is rough and hilly. Much of it is unglaciated and hence drainage is well developed, with no ponds, lakes, or marshes to serve as mosquito breeding places. The only favorable places are springs, spring pools, seepage pools, and small clear streams. In all of these locations larvae were found in numbers.

By far the dominant species in the whole range of differing habitats was *A. punctipennis*, which constituted 98.8 percent of all the anophelines reared from these inland collections. The remaining 1.2 percent consisted of 13 *quadrimaculatus*. The latter were all reared from static water while *punctipennis* alone was found in all the streams and springs examined. The streams were usually rather small, clean, with sand bottoms and a marginal fringe of green filamentous algae. In this fringe *punctipennis* larvae were always found in numbers. Many were observed on the very edge of the algal margins, moving back and forth in the currents. On many occasions the larvae were so numerous that they could easily be collected in a teaspoon. In a number of places, 12 to 15 could be obtained in a single teaspoonful.

SUMMARY

In considering the results of this preliminary survey, it should again be emphasized that it covered a period of only 1 month, beginning on August 26, 1939. Weather conditions were unusually favorable, the mean temperature for the month being 69.1° F., which was 6.6° F. above the average. It did not fall below the freezing point during the month, which was very unusual.

Under these conditions it is probable that the anopheline populations were at their peak. The situation is complicated, too, by the fact that the hibernation periods for the various species were approaching. No data were available regarding the early or midseason conditions.

The findings for the period of the survey, August 26 to September 25, may be summarized as follows:

1. Anopheline mosquitoes were found to be much more abundant in the Mississippi River valley, from Wabasha, Minn., to La Crosse, Wis., than had previously been supposed.

2. Four species of anophelines already reported for Minnesota were found: *Quadrimaculatus*, *walkeri*, *punctipennis*, and *maculipennis*. *Maculipennis*, which occurs commonly in northern Minnesota, was so rare as to indicate that it is of no significance in the survey area.

3. On the basis of building collections alone, where it constituted 91.7 percent of the anopheline catch, *quadrimaculatus* would appear to be the most common species in the valley proper, while *punctipennis* was the most abundant inland (85.7 percent). *Walkeri* was almost absent in these collections although there is reason to believe that it may be the most common of the four.

4. In light trap collections in the residential district of Wabasha *quadrimaculatus* was present to the extent of 74.4 percent while in the catches by traps located near extensive swamp areas at both Wabasha and La Crosse *walkeri* made up 67.7 percent and 84.7 percent, respectively, of the total anophelines.

5. In the small collection of anophelines attacking man in the open, *walkeri* was the dominant species. This is in agreement with observations elsewhere in Minnesota, and emphasizes the need for detailed studies on the biology of the species.

6. Anophelines were breeding abundantly throughout the valley in the extensive sloughs and backwaters. Larval collections yielded 57.4 percent *quadrimaculatus* and 38.6 percent *punctipennis*. Such evidence as is available indicates that *walkeri* oviposition is less concentrated but that it occurs in submerged grassy areas which are extensive in the region. An alternative is that the favorable season for larval development of the species had passed.

7. Data from collections from buildings, from light traps, hand catches, and larval collections revealed a surprisingly high incidence of anophelines, with *quadrimaculatus* and *walkeri* the dominant species.

While there are no data relative to the abundance of these species prior to installation of the dams for improvement of navigation, there is evidence that there has been a marked increase in favorable breeding places in the river valley for *quadrimaculatus* and apparently for *walkeri* as well.

8. Inland, in contrast to conditions in the river valley proper, *punctipennis* was the only anopheline found breeding in numbers. It constituted 98.8 percent of the specimens reared from the inland collections.

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POST-SANATORIUM TUBERCULOSIS SURVIVAL RATES IN MINNESOTA[1]

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In order to plan wisely for after-care and rehabilitation of tuberculous patients discharged from sanatoria, accurate statistics should be made available regarding mortality and survival rates. Consideration should be given in the determination of these rates to such factors as the age and sex of the patient, the extent of the tuberculosis, status of the sputum, the effect of collapse therapy, and the condition of the patient on discharge. The purpose of this report is to present statistics on survival rates of persons with tuberculosis discharged from public sanatoria in Minnesota during the years 1926 to 1935, inclusive.

The data used in this study have been obtained from 1 State and 14 county sanatoria which serve a population of approximately

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2,600,000 in Minnesota, scattered over an area of more than 84,000 square miles. These institutions comprise all of the public sanatoria in the State. There is only 1 small private sanatorium in Minnesota.

The 1 large State sanatorium, with a bed capacity of 365, serves a predominantly rural area; the county sanatoria group consists of 2 large sanatoria with bed capacities of 694 and 226, respectively, each of which serves a metropolitan area; 1 large sanatorium with 235 beds serving a rural area which contains 1 metropolitan center of 100,000 people; and the 11 small county sanatoria, with bed capacities ranging from 26 to 100, serving the remainder of the rural population.

On January 1, 1940, there were available in these 15 sanatoria 2,287 beds for tuberculous patients. With the exception of facilities for Indians, which have been increased in number, approximately the same number of beds have been available for several years. On January 1, 1940, vacancies existed in several of these institutions. The ratio of beds to positive-sputum cases indicates adequate sanatorium facilities for proper treatment.

The total number of persons discharged from these sanatoria during 1926–35 was 10,990. In table 1 these individuals have been grouped according to the type of sanatorium from which they were discharged and have been classified by the diagnosis at the time of discharge. Of the total group, 81.5 percent (8,958) had reinfection type, 4.7 percent (513) had first-infection type, and 3.1 percent (339) had nonpulmonary tuberculosis, according to the classification of the National Tuberculosis Association. There were 19 patients with miliary tuberculosis and 47 with pleurisy of a nonspecific type. Of the total group, 3.9 percent (425) were discharged as not having tuberculosis. In addition, 6.3 percent (689) were discharged as "suspects," after careful examination by qualified specialists. Most of these latter patients had been admitted to the sanatoria with a diagnosis of tuberculosis.

TABLE 1.—*Distribution of discharged patients by diagnosis on discharge from urban and rural sanatoria, Minnesota, 1926–35, inclusive*

Diagnosis on discharge[1]	2 large urban		1 large urban and rural		1 large rural		11 small rural		Total, 15 sanatoria	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Reinfection type tuberculosis	4,448	81.3	970	75.6	1,449	81.7	2,091	85.0	8,958	81.5
First-infection type tuberculosis	277	5.1	125	9.8	62	3.5	49	2.0	513	4.7
Miliary tuberculosis	12	.2	3	.2			4	.2	19	.1
Nonpulmonary tuberculosis	203	3.7	64	5.0	13	.8	59	2.5	339	3.1
Pleurisy, nonspecific	28	.5	2	.1			17	.6	47	.4
Suspect	220	4.0	112	8.7	197	11.1	160	6.5	689	6.3
Nontuberculous	287	5.2	7	.6	52	2.9	79	3.2	425	3.9
Total	5,475	100.0	1,283	100.0	1,773	100.0	2,459	100.0	10,990	100.0

[1] According to the National Tuberculosis Association classification.

Only patients with the diagnosis of reinfection type of pulmonary tuberculosis based upon careful history, physical examination, examination of the sputum, tuberculin tests when indicated, and X-ray films were included in this study. Table 2 shows the distribution of these patients separated into 3 classifications; 14.3 percent were minimal, 26.5 percent moderately advanced, and 59.2 percent far advanced. Thus, 86 out of every 100 of these patients had advanced tuberculosis.

TABLE 2.—*Distribution of discharged patients with reinfection type tuberculosis by pulmonary (National Tuberculosis Association) diagnosis on discharge from urban and rural sanatoria, Minnesota, 1926–35, inclusive*

Diagnosis on discharge	2 large urban		1 large urban and rural		1 large rural		11 small rural		Total, 15 sanatoria	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Minimal	359	8.1	89	9.2	485	33.5	346	16.6	1,279	14.3
Moderately advanced	1,080	24.3	242	24.9	335	23.1	720	34.4	2,377	26.5
Far advanced	3,009	67.6	639	65.9	629	43.4	1,025	49.0	5,302	59.2
Total reinfection type tuberculosis	4,448	100.0	970	100.0	1,449	100.0	2,091	100.0	8,958	100.0

An important factor in the determination of survival rates of tuberculous patients is the number of readmissions to sanatoria during the period. Of the 8,958 patients of all ages, 6,822 were 20 to 49 years old. Seventy-five percent (5,100) were admitted only once, 36.9 percent (2,515) were discharged and were alive at the end of the period of observation (including those untraced after discharge), 11.2 percent (767) were alive on discharge but died during the period of observation, and 26.6 percent (1,818) were dead on discharge after their first admission. There were 22.4 percent (1,526) who had more than 1 admission and discharge; 12.3 percent (837) were alive on discharge and at the end of the follow-up period; 3.4 percent (235) were discharged alive but died thereafter, and 6.7 percent (454) were persons who were readmitted and were dead on discharge. The remaining 2.9 percent (196) were persons who were readmitted after their last discharge and were in residence in the sanatorium at the end of the study in 1937. Only the interval of time from the last discharge to readmission was included in the follow-up period of these 196 persons.

The variation in age-specific death rates indicates the part played by age in the mortality from pulmonary tuberculosis. These rates are low for persons under 5 years of age, very low for those between 5 and 15 years, and very high for those from 15 to 50 years; the mortality rates decrease after age 50 only to rise again after 60 years of age. Because the age-specific annual death rates from tubercu-

losis among persons 20 to 49 years of age seemed similar, it was decided to include in this study only persons in that age group.

It is recognized also that sex is a factor in the mortality experience of individuals with tuberculosis, but this was not considered in this study.

Table 3 shows the distribution of patients with reinfection type tuberculosis who were discharged alive, grouped by 5-year class intervals for persons 20 to 49 years of age. Of the total group of 8,958 persons with this type of tuberculosis, 5,772 were discharged alive, and 4,550 of these were between 20 and 49 years of age. Persons in this age group comprised, therefore, 78.8 percent of the total alive on discharge. There was a slightly greater number of persons 20 to 24 years of age and a correspondingly smaller number in the age groups 40 to 44 years and 45 to 49 years among the patients with minimal disease than among those with moderately advanced and far-advanced disease. Otherwise, the distribution of patients by 5-year age groups and by stage of the disease on discharge among those 20 to 49 years of age was fairly uniform.

TABLE 3.—*Patients discharged alive, by age groups and National Tuberculosis Association classification, for public sanatoria in Minnesota, 1926–35, inclusive*

Age on discharge	Stage of disease on discharge						Total	
	Minimal		Moderately advanced		Far advanced			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
20-24	267	29.9	356	21.4	389	19.5	1,012	22.2
25-29	236	26.4	447	26.9	529	26.5	1,212	26.6
30-34	181	20.2	331	19.9	381	19.1	893	19.6
35-39	101	11.3	222	13.4	257	12.9	580	12.8
40-44	61	6.8	167	10.0	241	12.1	469	10.3
45-49	48	5.4	140	8.4	196	9.9	384	8.5
Total, 20-49	894	100.0	1,663	100.0	1,993	100.0	4,550	100.0
All other ages	350	28.0	403	19.5	469	19.0	1,222	21.2
20-49	894	72.0	1,663	80.5	1,993	81.0	4,550	78.8
Total, group	1,244	100.0	2,066	100.0	2,462	100.0	5,772	100.0

Table 4 shows the distribution of persons with reinfection type tuberculosis, aged 20 to 49 years, by the total number discharged alive, dead, traced and untraced, for each of the sanatoria groups.

The untraced persons were not observed after the date of discharge; therefore, they were not included in the survival tables. For any particular year after discharge, the traced persons included those present at the beginning of the ensuing year, and also one-half of the experience of those followed 1 to 11.9 months during that year, but not present at the beginning of the ensuing year.

Table 4.—*Discharged patients 20 to 49 years of age, traced and untraced and dead on discharge, by stage of disease (National Tuberculosis Association), for Minnesota sanatoria (public), 1926–35, inclusive*

Sanatoria	Status on discharge	Stage of disease on discharge					
		Minimal		Moderately advanced		Far advanced	
		Number	Percent	Number	Percent	Number	Percent
2 large urban	Alive on discharge	279	100.0	755	100.0	1,095	100.0
	Traced	265	95.0	707	94.0	1,050	96.0
	Untraced	14	5.0	48	6.0	45	4.0
	Dead on discharge	11	3.8	114	13.1	1,157	51.4
	Number discharged	290		869		2,252	
1 large urban and rural	Alive on discharge	41	100.0	175	100.0	291	100.0
	Traced	38	93.0	167	95.0	283	97.0
	Untraced	3	7.0	8	5.0	8	3.0
	Dead on discharge	1	2.4	13	6.9	195	40.1
	Number discharged	42		188		486	
1 large rural	Alive on discharge	339	100.0	245	100.0	287	100.0
	Traced	203	60.0	172	70.0	222	77.0
	Untraced	136	40.0	73	30.0	65	23.0
	Dead on discharge	10	2.9	22	8.2	192	40.1
	Number discharged	349		267		479	
11 small rural	Alive on discharge	235	100.0	488	100.0	320	100.0
	Traced	181	77.0	441	90.0	285	89.0
	Untraced	54	23.0	47	10.0	35	11.0
	Dead on discharge	5	2.0	75	13.3	477	59.9
	Number discharged	240		563		797	
All sanatoria	Alive on discharge	894	100.0	1,663	100.0	1,993	100.0
	Traced	687	77.0	1,487	89.0	1,840	92.0
	Untraced	207	23.0	176	11.0	153	8.0
	Dead on discharge	27	2.9	224	11.9	2,021	50.4
	Number discharged	921		1,887		4,014	

Of the 4,550 persons discharged alive, 11.8 percent (536) were untraced after discharge. In general the percentages untraced by individual sanatoria are under 10, with the exception of the large rural sanatorium which serves 46 of the 87 counties in Minnesota. These 46 counties are scattered widely throughout the State. There have been insufficient funds and personnel to carry on an adequate follow-up service for this sanatorium, and principally for this reason more patients were untraced (31.5 percent of the total) than from the other institutions. In contrast, among persons discharged from the one large urban and rural sanatorium which has an efficient follow-up system (with local clinics, nurses, and social workers in the field) only 7 percent of the minimal, 5 percent of the moderately advanced, and 3 percent of the far-advanced patients were untraced after discharge.

Of the 6,822 persons 20 to 49 years of age (table 4) 13.5 percent (921) were classified as minimal, and of this group, 2.9 percent (27) were dead on discharge. There were 27.7 percent (1,887) with moderately advanced disease, and of this group 11.9 percent (224) were dead on discharge. There were 58.8 percent (4,014) far advanced on discharge, and of this group 50.4 percent (2,021) were dead on discharge.

SURVIVAL RATES

Studies on death and survival rates of tuberculous patients were reviewed by the author (*1*) in 1936, and by Brieger (*2*) in 1937. Several studies of a similar nature have appeared in the literature since the discussion by Frost (*3*), in 1933, on the use of life-table methods in studying mortality experience of those coming in contact with tuberculous patients.

The use of a modified and simplified method of life-table analysis, as formulated recently by Puffer (*4*), is convenient for a follow-up study of individuals where the periods of continuous observation vary. The procedure as explained by Puffer is as follows:

The death rate which it is desired to obtain is the rate known in life-tables as the "probability of death" (q_x) within a year. This is expressed by the ratio $q_x=\frac{d_x}{l_x}$ where l_x is the number present at the beginning of the year and d_x is the number of those who died within the year. This statement, however, assumes that all those not known to have died within the year can be known to have survived through the year. In the data available, some of the cases were under observation less than a full year while others moved from the county, so that the period of observation terminated within a year after first observation. Thus a certain number (w_x) of those who entered the experience (l_x) were withdrawn from the experience during the year. Each of the persons thus withdrawn is counted as having been exposed to (and survived) ½ year's experience so that the number at risk for the whole year is taken as

$$l_x-\tfrac{1}{2}w_x \text{ and } q_x=\frac{d_x}{l_x-\frac{1}{2}w_x}.$$

The probability of survival can be obtained by subtraction of the probability of death (q_x) from 1, as $p_x=1-q_x$. If $100q_x$ is the percentage dying during a year, $100p_x$ is the percentage surviving through the year.

From the percentages surviving each year the percentage of those originally at risk who survived h years can be obtained Thus, since $100p_x$ survive the first year and $100p_{x+1}$ of these survive through the second year, the proportion of the original number who survive through 2 years ($100{}_2p_x$) is equal to $100(p_x\times p_{x+1})$. The risk of dying within the first h years ($100{}_hq_x$) is $100(1-{}_hp_x)$.

By this simple method, either the risk of dying or the probability of surviving may be obtained at certain time intervals after discharge. The actual operation of this method may be followed by observing the first line of figures in table 5.

Survival rates on tuberculous patients discharged from sanatoria should not be used as a measure of the results of sanatorium treatment. This can be done only by comparing one group of patients which has had sanatorium care with another group which has had no sanatorium care. However, survival rates can be of real value in vocational rehabilitation planning. It is essential to know the effect of such factors as the stage of the disease, the age of the patient, and the status of the sputum on the probability of survival over a period of time for persons with tuberculosis, for whom future plans of vocational training and placement are being made. Accurate statistics on sur-

vival experience in the hands of the medical consultant will provide him with additional facts upon which to base sound recommendations for the use of the vocational counselor.

In this study of survival rates, because of the limited number of individuals, only certain factors were considered. These were: (1) Age, which was limited to those persons from 20 to 49 years; (2) the stage of disease on discharge, according to the classification of the National Tuberculosis Association as minimal, moderately advanced, and far-advanced pulmonary tuberculosis; (3) the condition of the sputum on discharge, whether positive or negative. Some important factors which were not considered in this study were the length of stay in a sanatorium, the number of admissions to and discharges from the sanatorium, the sex of patients, the influence of collapse therapy, and the occupational groups from which the individuals were drawn. Statements regarding survival rates on these patients should be qualified by the effects of such factors.

Table 5 shows the survival rates from 1 through 6 years after discharge for patients 20 to 49 years old, by stage of disease and status of sputum, from all 15 public sanatoria and for each of the sanatoria groups.

TABLE 5.—*Survival rates of patients 20 to 49 years of age, by stage of disease and sputum on discharge, from public sanatoria in Minnesota, 1926-35, inclusive*

Stage of disease	Interval after discharge (years)	Present at beginning of year	Withdrawn during year	Average at risk during year	Number dying during year	Percentage surviving through specified year	Percentage surviving through past and specified years
	15 public sanatoria—Positive-sputum patients [1]						
Moderately advanced	0-1	234	5	231.5	41	82.3	82.3
	1-2	188	7	184.5	42	77.2	63.6
	2-3	139	8	135	16	88.2	56.0
	3-4	115	17	106.5	13	87.8	49.2
	4-5	85	10	80	9	88.8	43.6
	5-6	66	8	62	3	95.2	41.6
Far advanced	0-1	633	18	624	213	65.8	65.8
	1-2	402	20	392	119	69.6	45.8
	2-3	263	26	250	43	82.8	38.0
	3-4	194	30	179	26	85.4	32.4
	4-5	138	28	124	22	82.2	26.7
	5-6	88	14	81	4	95.0	25.4
	15 public sanatoria—Negative-sputum patients						
Minimal	0-1	664	46	641	3	99.5	99.5
	1-2	615	54	588	6	99.0	98.5
	2-3	555	72	519	7	98.6	97.2
	3-4	476	89	431.5	2	99.5	96.7
	4-5	385	70	350	1	99.7	96.4
	5-6	314	61	283.5	0	100.0	96.4
Moderately advanced	0-1	1,253	50	1,228	23	98.1	98.1
	1-2	1,180	65	1,147.5	34	97.0	95.2
	2-3	1,081	126	1,018	21	97.9	93.3
	3-4	934	145	861.5	14	98.4	91.8
	4-5	775	134	708	17	97.6	89.6
	5-6	624	114	567	6	98.9	88.6
Far advanced	0-1	1,207	34	1,190	50	95.8	95.8
	1-2	1,123	50	1,098	50	95.4	91.4
	2-3	1,023	121	962.5	38	96.0	87.8
	3-4	864	175	776.5	34	95.6	84.0
	4-5	655	136	587	22	96.2	80.8
	5-6	497	134	430	9	97.9	79.1

[1] Insufficient number of persons (23) to set up survival rates for those classified as minimal with positive sputum.

TABLE 5.—*Survival rates of patients 20 to 49 years of age, by stage of disease and sputum on discharge, from public sanatoria in Minnesota, 1926–35, inclusive*—Continued

Stage of disease	Interval after discharge (years)	Present at beginning of year	Withdrawn during year	Average at risk during year	Number dying during year	Percentage surviving through specified year	Percentage surviving through past and specified years
	2 large urban sanatoria—Positive-sputum patients						
Moderately advanced	0–1	66	4	64	10	84.4	84.4
	1–2	52	3	50.5	7	86.1	72.7
	2–3	42	4	40	3	92.5	67.2
	3–4	35	7	31.5	3	90.5	60.8
	4–5	25	4	23	2	91.3	55.5
	5–6	19	3	17.5	2	88.6	49.2
Far advanced	0–1	272	13	265.5	82	69.1	69.1
	1–2	177	4	175	45	74.3	51.3
	2–3	128	11	122.5	20	83.7	42.9
	3–4	97	13	90.5	10	89.0	38.2
	4–5	74	18	65	14	78.5	30.0
	5–6	42	8	38	3	92.1	27.6
	1 large urban and rural sanatorium—Positive-sputum patients						
Moderately advanced	0–1	19	0	19	5	73.7	3 77
	1–2	14	0	14	5	64.3	47.4
	2–3	9	0	9	2	77.8	36.9
	3–4	7	0	7	2	71.4	26.3
	4–5	5	1	4.5	1	77.8	20.5
	5–6	3	0	3	0	100.0	20.5
Far advanced	0–1	91	1	90.5	40	55.8	55.8
	1–2	50	3	48.5	24	50.5	28.2
	2–3	23	2	22	5	77.3	21.8
	3–4	16	1	15.5	3	80.6	17.6
	4–5	12	2	11	1	90.9	16.0
	5–6	9	0	9	0	100.0	16.0
	1 large rural sanatorium—Positive-sputum patients						
Moderately advanced	0–1	63	1	62.5	7	88.8	88.8
	1–2	55	4	53	14	73.6	65.4
	2–3	37	2	36	3	91.7	60.0
	3–4	32	7	28.5	5	82.5	49.5
	4–5	20	3	18.5	2	89.2	44.2
	5–6	15	2	14	0	100.0	44.2
Far advanced	0–1	123	1	122.5	32	73.9	73.9
	1–2	90	10	85	25	70.6	52.2
	2–3	55	7	51.5	7	86.4	45.1
	3–4	41	11	35.5	5	85.9	38.7
	4–5	25	3	23.5	6	74.5	28.8
	5–6	16	4	14	0	100.0	28.8
	11 small rural sanatoria—Positive-sputum patients						
Moderately advanced	0–1	86	0	86	19	77.9	77.9
	1–2	67	0	67	16	76.1	59.3
	2–3	51	2	50	8	84.0	49.8
	3–4	41	3	39.5	3	92.4	46.0
	4–5	35	2	34	4	88.2	40.6
	5–6	29	3	27.5	1	96.4	39.1
Far advanced	0–1	147	3	145.5	59	59.5	59.5
	1–2	85	3	83.5	25	70.1	41.7
	2–3	57	6	54	11	79.6	33.2
	3–4	40	5	37.5	8	78.7	26.1
	4–5	27	5	24.5	1	95.9	25.0
	5–6	21	2	20	1	95.0	23.8

Table 5.—*Survival rates of patients 20 to 49 years of age, by stage of disease and sputum on discharge, from public sanatoria in Minnesota, 1926–35, inclusive*—Continued

Stage of disease	Interval after discharge (years)	Present at beginning of year	Withdrawn during year	Average at risk during year	Number dying during year	Percentage surviving through specified year	Percentage surviving through past and specified years
	2 large urban sanatoria—Negative-sputum patients						
Minimal	0–1	259	23	247.5	1	99.6	99.6
	1–2	235	18	226	1	99.6	99.2
	2–3	216	41	195.5	1	99.5	98.7
	3–4	174	36	156	1	99.4	98.1
	4–5	137	25	124.5	0	100.0	98.1
	5–6	112	30	97	0	100.0	98.1
Moderately advanced	0–1	641	35	623.5	13	97.9	97.9
	1–2	593	36	575	14	97.6	95.6
	2–3	543	75	505.5	6	98.8	94.5
	3–4	462	83	420.5	9	97.9	92.5
	4–5	370	67	336.5	10	97.0	89.7
	5–6	293	56	265	3	98.9	88.7
Far advanced	0–1	778	34	761	23	97.0	97.0
	1–2	721	32	705	25	96.5	93.6
	2–3	664	79	624.5	26	95.8	89.7
	3–4	559	122	498	21	95.8	85.9
	4–5	416	77	377.5	13	96.6	83.0
	5–6	326	93	279.5	7	97.5	80.9
	1 large rural and urban sanatorium—Negative-sputum patients						
Minimal	0–1	38	1	37.5	1	97.3	97.3
	1–2	36	5	33.5	0	100.0	97.3
	2–3	31	1	30.5	0	100.0	97.3
	3–4	30	6	27	0	100.0	97.3
	4–5	24	3	22.5	0	100.0	97.3
	5–6	21	4	19	0	100.0	97.3
Moderately advanced	0–1	148	4	146	5	96.6	96.6
	1–2	139	13	132.5	5	96.2	92.9
	2–3	121	13	114.5	1	99.1	92.1
	3–4	107	19	97.5	2	97.9	90.2
	4–5	86	16	78	3	96.2	86.8
	5–6	67	16	59	2	96.6	83.8
Far advanced	0–1	192	0	192	19	90.1	90.1
	1–2	173	4	171	11	93.6	84.3
	2–3	158	21	147.5	6	95.9	80.8
	3–4	131	27	117.5	2	98.3	79.4
	4–5	102	31	86.5	4	95.4	75.7
	5–6	67	14	60	1	98.3	74.4
	1 large rural sanatorium—Negative-sputum patients						
Minimal	0–1	195	21	181.5	1	99.5	99.5
	1–2	173	29	158.5	3	98.1	97.6
	2–3	141	18	132	3	97.7	95.4
	3–4	120	26	107	1	99.1	94.5
	4–5	93	19	83.5	0	100.0	94.5
	5–6	74	18	65.	0	100.0	94.5
Moderately advanced	0–1	109	8	105.	0	100.0	100.0
	1–2	101	12	95.	5	94.7	94.7
	2–3	84	15	76.5	5	93.5	88.5
	3–4	64	12	58	1	98.3	87.0
	4–5	51	7	47.5	1	97.9	85.2
	5–6	43	7	39.5	0	100.0	85.2
Far advanced	0–1	99	0	99	3	97.0	97.0
	1–2	96	11	90.5	10	89.0	86.3
	2–3	75	10	70	2	97.1	83.8
	3–4	63	13	56.5	9	84.1	70.5
	4–5	41	11	35.5	2	94.4	66.6
	5–6	28	8	24	0	100.0	66.6

TABLE 5.—*Survival rates of patients 20 to 49 years of age, by stage of disease and sputum on discharge, from public sanatoria in Minnesota, 1926–35, inclusive*—Continued

Stage of disease	Interval after discharge (years)	Present at beginning of year	Withdrawn during year	Average at risk during year	Number dying during year	Percentage surviving through specified year	Percentage surviving through past and specified years
	11 small rural sanatoria—Negative-sputum patients						
Minimal	0–1	172	1	171.5	0	100.0	100.0
	1–2	171	2	170	2	98.8	98.8
	2–3	167	12	161	3	98.1	96.9
	3–4	152	21	141.5	0	100.0	96.9
	4–5	131	23	119.5	1	99.2	96.1
	5–6	107	9	102.5	0	100.0	96.1
Moderately advanced	0–1	355	3	353.5	5	98.6	98.6
	1–2	347	4	345	10	97.1	95.7
	2–3	333	23	321.5	9	97.2	93.0
	3–4	301	31	285.5	2	99.3	92.3
	4–5	268	44	246	3	98.8	92.1
	5–6	221	35	203.5	1	99.5	91.6
Far advanced	0–1	138	0	138	5	96.4	96.4
	1–2	133	3	131.5	4	97.0	93.5
	2–3	126	11	120.5	4	96.7	90.4
	3–4	111	13	104.5	2	98.1	88.7
	4–5	96	17	87.5	3	96.6	85.7
	5–6	76	19	66.5	1	98.5	84.4

There was an insufficient number of persons (23) with minimal tuberculosis and positive sputum in the 15 public sanatoria to set up survival rates for that group. The minimal group with negative sputum (664) had a survival rate of 99.5 percent for the first year after discharge (0–1 year interval) which gradually decreased to 96.4 percent for the 6-year period after discharge (0–6 year interval).

The moderately advanced, positive-sputum group (234) had a survival rate of 82.3 percent for the first year after discharge, which decreased to 63.6 percent for the first 2 years and then leveled off to 56.0, 49.2, 43.6, and 41.6 percent for the first 3, 4, 5, and 6 years after discharge, respectively. Rates for the negative-sputum patients in the moderately advanced group (1,253) were markedly different from the rates for those with positive sputum in the same group. The rate for the negative-sputum patients during the first year after discharge was 98.1 percent; it decreased to 95.2 percent for the first 2 years after discharge, and remained at the relatively high level of 88.6 percent for the entire 6-year period.

The far-advanced, positive-sputum group (633) had a low survival rate of 65.8 percent for the 0–1 year interval; it decreased to 45.8 percent for the 2-year interval, to 38.0 percent for the 3-year interval, and leveled off to 32.4, 26.7, and 25.4 percent for the periods of 4, 5, and 6 years after discharge, respectively. The far-advanced, negative-sputum group (1,207) had a high survival rate of 95.8 percent at the 0–1 year interval; the rate decreased to 84 percent for the 0–4 year period, and leveled off to 80.8 percent for the 0–5 year interval and 79.1 percent for the entire 6-year period.

The survival rates of the groups from the different sanatoria show minor variations among themselves, as may be seen in table 5.

Table 6 gives a summary of the survival rates for intervals after discharge of persons 20 to 49 years old with reinfection type tuberculosis, by stage of disease and status of sputum on discharge. The most striking fact is the influence of the status of the sputum on discharge on the survival rates of persons in various stages of pulmonary tuberculosis. There is a surprising uniformity in the rates for the various sanatoria groups; these sanatoria vary in type of rural and urban population served as well as in size and facilities.

TABLE 6.—*Survival rates at intervals after discharge of persons with reinfection type tuberculosis 20 to 49 years of age, by stage of disease (National Tuberculosis Association) and sputum on discharge, by rural and urban sanatoria, for public sanatoria in Minnesota, 1926–35, inclusive*

Stage of disease	Sputum examination	2 large urban		1 large urban and rural		1 large rural		11 small rural		Total, 15 sanatoria	
		Interval after discharge in years									
		0–1	0–6	0–1	0–6	0–1	0–6	0–1	0–6	0–1	0–6
Minimal	Positive	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	Negative	99.6	98.1	97.3	97.3	99.5	94.5	100 0	96.1	99.5	96 4
Moderately advanced	Positive	84.4	49.2	73 7	20 5	88.8	44 2	77 9	39.1	82 3	41.6
	Negative	97.9	88.7	96 6	83.8	100.0	85 2	98.6	91 6	98.1	88.6
Far advanced	Positive	69 1	27 6	55.8	16 0	73.9	28 8	59 5	23.8	65 9	25.4
	Negative	97.0	80.9	90.1	74.4	97.0	66.6	96.4	84.4	95.8	79.1

At the beginning of each of the first 2 years after discharge patients with advanced tuberculosis and positive sputum experienced poor survival rates, which, however, had a tendency to level off at a low rate for the 0–5 and 0–6 year intervals.

It is noteworthy that the far-advanced, negative-sputum group had a survival rate of 79.1 percent for the 6-year period in spite of the fact that the patients in this group have more than one whole lung showing evidence of pulmonary tuberculosis.

In the total group of patients from all 15 sanatoria (table 6) the minimal negative-sputum group had a survival rate from 99.5 percent to 96.4 percent for the 0–1 and 0–6 year intervals, respectively. The number of patients in the minimal positive-sputum group was too small for the computation of significant survival rates. The moderately advanced, positive-sputum group had survival rates of 82.3 percent to 41.6 percent for the 0–1 and 0–6 year intervals, respectively. The rate for the moderately advanced, negative-sputum group was 98.1 percent for the first year after discharge and 88.6 percent for the entire 6-year period. The far-advanced, positive-sputum group experienced low survival rates; only 65.8 percent survived the first year and only 25.4 percent survived 6 years after discharge. The nega-

tive-sputum group had survival rates of 95.8 and 79.1 percent during the same intervals.

DISCUSSION

In a previous paper (*5*), the term, "annual case-survivorship rate," was suggested for general use in describing the experience after discharge of tuberculous patients who had required sanatorium care. After further consideration, it is suggested that this term be modified for the sake of clarity and simplicity to the "survival rate" at the 0–*h* year intervals, as used in the present study.

In Minnesota's fairly stable population of 2,600,000 a marked decline has occurred in the annual tuberculosis death rate during the last 15 years. In 1925 the rate was 64.3 per 100,000 persons, and in 1939 the low death rate of 30.0 had been reached. It is difficult to determine accurately what proportions of this decrease are assignable to (1) early diagnosis, (2) adequate sanatorium care, or (3) after-care and rehabilitation, because no common yardstick is available with which to measure the effect of each factor in a program for the control of tuberculosis.

It is true, however, that after-care and rehabilitation have received little attention up to the present time in tuberculosis programs. On the basis of experience in this field at Papworth Colony, England, the Central Station for Tuberculosis Control in Copenhagen, Denmark, the Metropolitan Life Insurance Co. in New York, Olive View Sanatorium in California, and Glen Lake Sanatorium in Minnesota, there are definite indications that rehabilitation may become an important factor in the further reduction of the mortality rate from tuberculosis in the United States.

By furnishing specialists in tuberculosis and vocational counselors with accurate statistics on survival rates, it is hoped that a sound basis may be established for vocational guidance, training, and placement of tuberculous persons discharged from sanatoria.

SUMMARY

Data for this study were derived from records of 10,990 persons discharged from public sanatoria in Minnesota from 1926 to 1935, inclusive; 8,958 of these persons had reinfection type tuberculosis; and 4,550 of this group were 20 to 49 years of age and alive on discharge.

Survival rates for varying intervals after discharge are presented for all persons 20 to 49 years of age, by stage of disease, status of sputum, and type of sanatorium in which care has been given.

The survival rates for the period of 6 years after discharge were as follows: Minimal negative-sputum group, 96.4 percent, moderately

advanced group, positive sputum, 41.6 percent, and negative sputum 88.6 percent; far-advanced group, positive-sputum group, 25.4 per-percent, and negative sputum, 79.1 percent.

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CHORIOMENINGITIS VIRUS INFECTION WITHOUT CENTRAL NERVOUS SYSTEM MANIFESTATIONS [1]

REPORT OF A CASE

By Charles Armstrong, *Senior Surgeon*, and J. W. Hornibrook, *Passed Assistant Surgeon, United States Public Health Service*

The occurrence of choriomeningitis virus infection in man, in which the central nervous system escaped demonstrable involvement, was postulated by Wooley, Armstrong, and Onstott (*1*) in 1937. At that time the clinical picture of this type of infection acquired in nature had not been identified. Its existence, however, was surmised on the basis of animal experimentation, as well as by human inoculation experiments carried out in France (*2*), and on the finding of specific antibodies in the sera of many persons from various parts of the United States who denied a history of central nervous system involvement (approximately 11 percent of over 2,000 sera contained antibodies) (*1*).

The object of this paper is to record the symptoms and the clinical picture, insofar as it was observed, of the first naturally occurring, proven case of the systemic type of the infection. The case occurred in a laboratory worker (V. H. H.) engaged in choriomeningitis research at the National Institute of Health.

It is regretted that the case was not more carefully observed but the patient was treated in his home and the clinician considered the case to be one of uncomplicated influenza until well into convalescence when its true identity was established by recovery of a strain of choriomeningitis virus from the blood stream. Subsequent to the attack the patient, moreover, developed specific neutralizing antibodies in his serum.

[1] From the Division of Infectious Diseases, National Institute of Health.

For the temperature record (figure 1) we are indebted to the patient's wife, a trained nurse.

CASE REPORT

The patient, V. H. H., a white male, aged 31, was engaged in choriomeningitis research. He had been well until March 11, 1940, when he experienced troublesome but not severe pains in his arms, shoulders, and back. His temperature was 37.4° C. The following day (March 12) he felt ill and the lumbar pain was intensified. At 3 p. m. his temperature was 38.5° C. Lumbar pain, malaise, and anorexia were his only complaints. On March 14 his temperature ranged from 37.5°

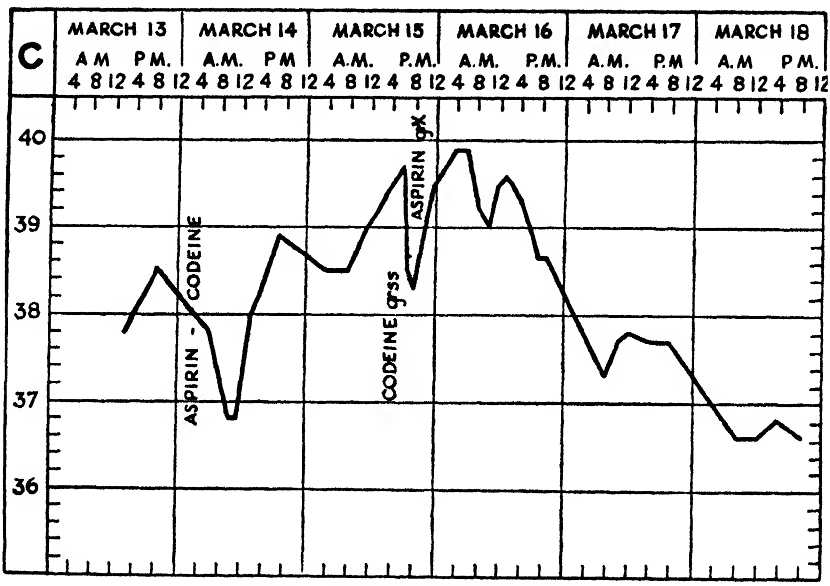

FIGURE 1.—Temperature chart of patient.

C. to 38.9° C. Prostration was fairly marked and the lumbar pain severe, requiring codeine for relief. Physical examination by J. W. H. on that day revealed a well-developed and well-nourished man, resting quietly in bed. The face was slightly flushed. He was well coordinated and cooperative. The only complaint was malaise and lumbar pain. The head was normal. There was no stiffness of the neck; the pupils were equal and reacted normally. The mouth presented no lesions; the throat was not congested. Chest expansion was equal and normal; no impaired resonance or rales were present and the voice sounds were normal. The heart was not enlarged and there were no murmurs. The pulse was regular and of good quality. There was no abdominal tenderness; the spleen and liver were not palpable. The extremities were normal. Kernig's sign was absent. The knee kicks were equal and active. On March 15 the patient's temperature

reached 39.7° C. and prostration was marked, but otherwise he was comfortable. A blood count revealed 2,900 white cells. The differential count based on 300 cells revealed polymorphonuclear neutrophiles, 45.3 percent; lymphocytes 49.6 percent, and mononuclear cells, 5 percent. The red cells appeared normal. On the sixth day of illness, March 16, the temperature reached its highest, 39.9° C. There was marked prostration and backache. The next day his fever was lower and the symptoms definitely improved. Weakness and prostration, however, were marked and persisted for a full week following the return of the temperature to normal on March 18.

In the absence of symptoms pointing to a central nervous system involvement, a spinal tap was not attempted.

Blood drawn on March 16, 1940, five days after onset, when inoculated intracerebrally into white mice produced the typical clinical and pathological picture of choriomeningitis and the strain of the virus was identified immunologically.

A sample of the patient's blood drawn on November 22, 1939, was negative when tested for specific antibodies, while a sample of blood drawn on April 28, 1940 (6 weeks after the attack) was markedly protective, only 2 of 16 mice succumbing to the inoculation, while with the earlier drawn serum 12 of 16 mice died.

DISCUSSION

The identification of an influenza-like systemic infection due to the virus of lymphocytic choriomeningitis is of interest in view of the fact that approximately 11 percent of 2,000 sera collected at random from various parts of the United States contained antibodies for this virus. These immune individuals, with rare exceptions, denied a history of central nervous system affection. These findings suggest, therefore, that a portion of the cases resembling grippe or uncomplicated influenza may be due to choriomeningitis virus.

SUMMARY

An influenza-like clinical picture occasioned by the virus of lymphocytic choriomeningitis is described. The only symptoms were fever, with pains in the arms, shoulders, and, especially, in the back, malaise, anorexia, and marked prostration. There was a marked leucopenia on the fifth day (2,900 cells); symptoms pointing to a central nervous system involvement were absent.

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FURTHER NEW SPECIES OF *ORNITHODOROS* FROM BATS (ACARINA: ARGASIDAE)[1]

By R. A. COOLEY, *Entomologist*, and GLEN M. KOHLS, *Assistant Entomologist, United States Public Health Service*

Two new species of argasid ticks, *Ornithodoros concanensis*, taken from a bat cave in Texas and a bat-inhabited mine tunnel in Arizona, and *O. kelleyi*, collected from bats, *Pipistrellus* sp., in Utah and Colorado, are described.

Ornithodoros concanensis n. sp.

Sexes similar; nymphs and adults similar.

ADULT

Body.—Suboval, sides nearly parallel, anterior margin bluntly pointed, posterior margin rounded. Marginal projection opposite coxa II moderate. Length of female 5.1 mm., width, 2.7 mm.

Mammillae.—Large, close but not crowded; sides and tops with a mixed pattern of ridges with but little appearance of radiation; the majority have one or two circular or crescentic pits on top, with a short, indistinct hair present in some of the pits, especially in the peripheral areas. Sizes about equal in lateral and median areas of dorsum, slightly larger on posterior margin; on the venter somewhat smaller than those on the dorsum, but larger on the posterior margin; absent on supracoxal folds.

Discs.—Those on the dorsum depressed and with edges elevated. Venter with the discs in lineal arrangement in the preanal and median postanal grooves; present also in three depressions caudad of the transverse postanal groove.

Legs.—Moderate in length and small in diameter; surfaces micromammillated. Tarsus I with a mild subapical dorsal protuberance; absent on all others. Dorsal humps absent on all tarsi. Length of tarsus I, 0.6 mm.; metatarsus, 0.45 mm.; length of tarsus IV, 0.72 mm.; metatarsus, 0.6 mm.

Coxae.—Coxae I and II well separated; all others contiguous. Surface micromammillated and also with mild excrescences.

Hood.—Limited to a short apical elevation which is separated from the anterior extension of the dorsal body wall by a depressed line.

Cheeks.—Oval, with the anterior end wider and free; attached by the side of the narrower portion.

Capitulum.—Basis capituli about as wide as long, surface with transverse wrinkles and numerous micromammillae; with a pair of

[1] From the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

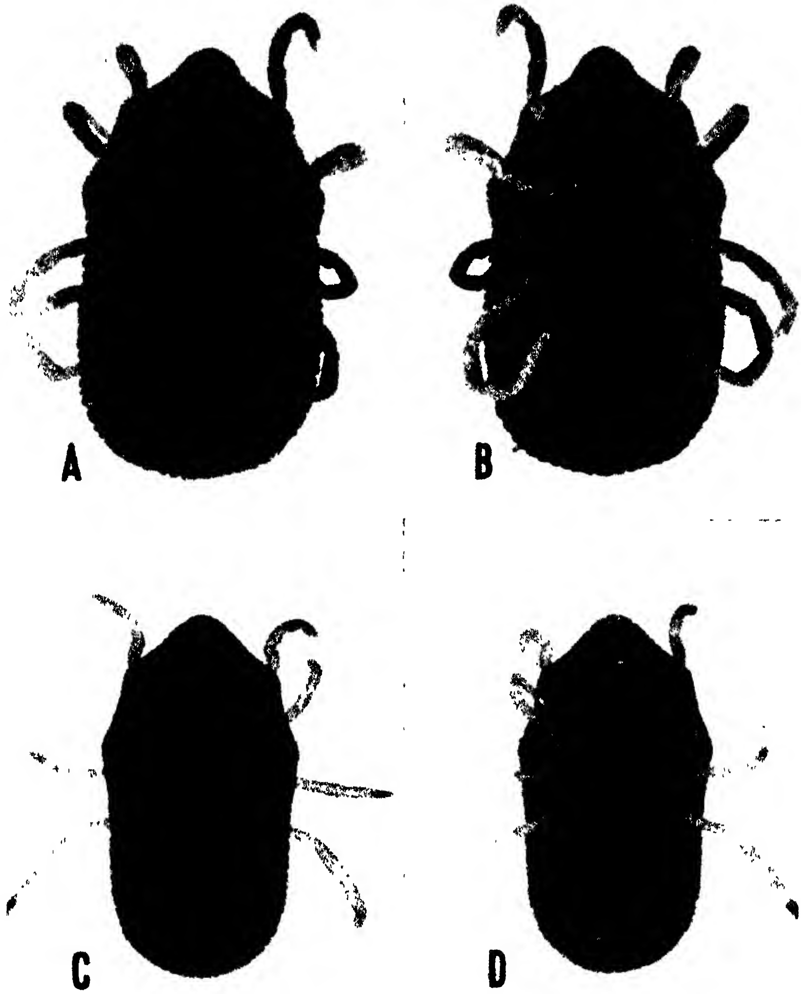

FIGURE 1.—*Ornithodoros concanensis* n. sp. and *Ornithodoros kelleyi* n. sp. A. *O. concanensis* dorsum. B. *O. concanensis*, venter. C. *O. kelleyi*, dorsum. D. *O. kelleyi*, venter.

fine hairs posterior to the posthypostomal hairs and a group of smaller hairs on each side behind. Article 1 of palpus micromammillated.

Hypostome.—Moderately long, sides nearly parallel, notched apically. Denticles in a 2/2 pattern with about four in each file and limited to the distal one-third. Length about 0.21 mm.

Folds.—Coxal and supracoxal folds present. Supracoxal fold reaching anteriorly to the hood.

Grooves.—Preanal, transverse postanal, and median postanal grooves present, the latter terminating at the transverse postanal groove. Dorso-ventral groove absent.

Sexual opening.—Placed at the level of the interval between coxae I and II.

Eyes.—Absent.

Anus.—In an oval frame.

This species resembles *talaje* and *kelleyi*. From *talaje* it is distinguished by being smaller, proportionately longer, more rounded on the posterior margin, the marginal projection opposite coxa II less pronounced, the hood shorter and the depressed areas occupied by the discs less depressed and less extensive. From *kelleyi* it is distinguished by being proportionately shorter and having the cheeks larger, as well as by having the hypostome wider beyond the middle and the palpi having more hairs.

Holotype.—Female from A. P. 17261.

Allotype.—Male from A. P. 17261.

Paratypes.—Adults and nymphs from A. P. 17261.

The holotype, allotype, and several paratypes are at the Rocky Mountain Laboratory. Paratypes have been sent to the following: United States National Museum, Washington, D. C.; Zoological Division, Bureau of Animal Industry, Washington, D. C.; Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; Department of Entomology, Cornell University, Ithaca, N. Y.; Division of Entomology and Parasitology, University of California, Berkeley, Calif.; Division of Entomology and Economic Zoology, University of Minnesota, Minneapolis, Minn.

The two known collections are from Texas and Arizona as follows: A. P. 17261, from guano and from rock crevices in a bat cave near Concan, Uvalde County, Tex., September 16, 1940, several adults and nymphs (Glen M. Kohls and Wm. L. Jellison); A. P. 17875, from rock crevices in a bat-inhabited mine tunnel, Las Guijas, Pima County, Ariz., May 25, 1940, two males, one nymph (Glen M. Kohls).

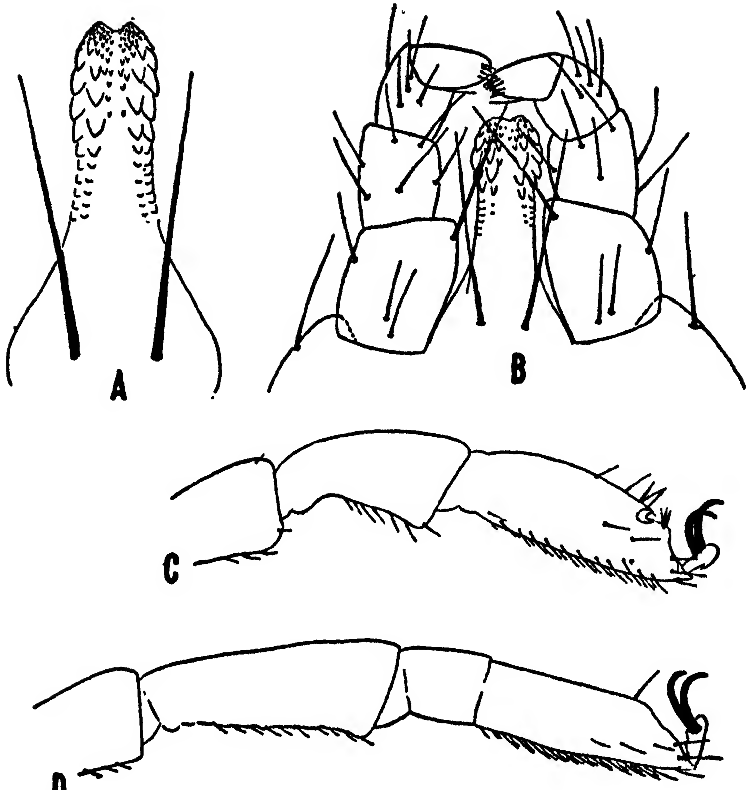

FIGURE 2.—*Ornithodoros concanensis* n. sp. A. Hypostome of adult. B. Hypostome and palpi of second nymphal stage. C. Leg I of adult. D. Leg IV of adult.

Ornithodoros kelleyi n. sp.

SECOND STAGE NYMPH

Body.—Suboval, widest at coxae II, bluntly pointed anteriorly and rounded behind; lateral view showing the anterior projection bent ventrad. Length, 3.6 mm.; width at coxae II, 2.0 mm.

Mammillae.—Moderate in size and number, close but not crowded, same in size in median and lateral areas, a little larger in posterior margin. Individual mammillae are irregular in shape, with irregular radiating ridges at their bases and with apical pits on some. Very short hairs, few in number, arise from some of the pits. Venter with the mammillae less elevated, more irregular on the supracoxal folds.

Discs.—Small, depressed, with their surfaces irregular and in the posterior area arranged in three lineal rows; on venter present in lineal arrangement in the preanal and median postanal grooves.

Legs.—Moderate in length and diameter. Surface mildly micromammillated. Subapical dorsal protuberance on tarsus I very small; absent on all other tarsi. Dorsal humps absent on all tarsi. Length

of tarsus I, 0.3 mm.; metatarsus, 0.21 mm. Length of tarsus IV, 0.33 mm.; metatarsus, 0.27 mm.

Coxae.—Coxae I and II separated; all others contiguous. Surface micromammillated and with irregular elevations.

Hood.—Absent or indistinct.

Cheeks.—Long oval, with the anterior end much wider and free, with the narrow, posterior end attached on one side.

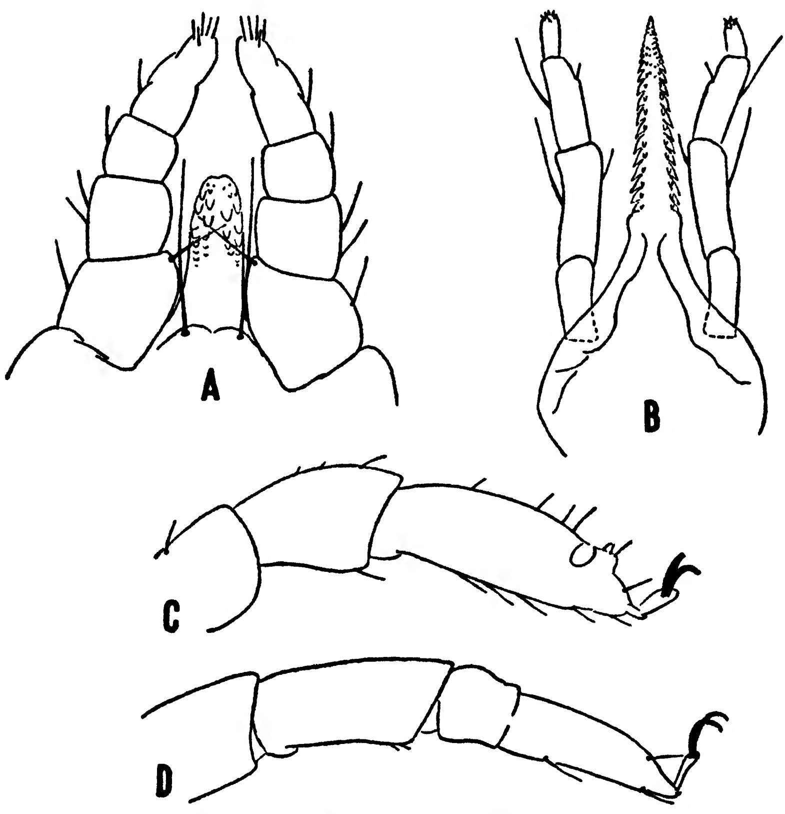

FIGURE 3.—*Ornithodoros kelleyi* n. sp. A. Hypostome and palpi of second nymphal stage, ventral view. B. Capitulum of larva, ventral view. C. Leg I of second nymphal stage. D. Leg IV of second nymphal stage.

Capitulum.—Basis capituli longer than wide, wider behind. Mildly protrusile, with the surface of basis capituli and "neck" micromammillated, and with a group of about three short hairs on each side behind. Surface of palpal article 1 faintly micromammillated.

Hypostome.—Sides about parallel, notched apically. Denticles in 2/2 arrangement with about four in each file. Posthypostomal hairs long, slightly longer than the hypostome. Length about 0.135 mm.

Folds.—Coxal and supracoxal folds present, the latter reaching anteriorly to near the capitulum.

Grooves.—Preanal, transverse postanal, and median postanal grooves present, the latter terminating at the transverse postanal groove which is short and without lateral extensions. Dorso-ventral groove absent.

Eyes.—Absent.

Anus.—In an elliptical frame.

Differs from *talaje* and *concanensis* by having the body more elongated, with the posterior margin well rounded and showing no tendency to become truncate, and by having the hypostome tapering from the middle apically as well as by other characters.

Holotype.—Nymph from A. P. 17473.

Paratypes.—Two nymphs from A. P. 17043 and one nymph, A. P. 17044.

The holotype and one paratype (17044) are at the Rocky Mountain Laboratory. One paratype (17043) has been sent to the United States National Museum and one (17043) has been sent to the Division of Entomology and Parasitology, University of California, Berkeley, Calif.

The three known collections of this species, all by Mr. J. Frenkel from *Pipistrellus* sp., are as follows: A. P. 17473, 4 miles north of Thompsons, Grand County, Utah, July 31, 1940, one nymph; A. P. 17044, locality and date as above, one nymph; A. P. 17043, 3 miles east of Utah-Colorado State line on highway US 50, July 29, 1940, two nymphs.

The species is named in honor of Mr. Thomas F. Kelley, Division of Entomology and Parasitology, University of California, who placed the specimens at our disposal.

SIPHONAPTERA. A STUDY OF THE SPECIES INFESTING WILD HARES AND RABBITS OF NORTH AMERICA NORTH OF MEXICO [1]

A Review

The material embodied in this bulletin represents the results of a study carried out at the Rocky Mountain Laboratory (Hamilton, Montana) of the Division of Infectious Diseases, National Institute of Health, U. S. Public Health Service, and the Division of Entomology and Economic Zoology, University of Minnesota.

Available data are presented pertaining to the distribution and host relationships of the nine species and subspecies of fleas infesting wild hares and rabbits of North America north of Mexico. These species are: *Cediopsylla simplex* (Baker) 1895, *C. inaequalis inaequalis* (Baker) 1895, *C. inaequalis interrupta* Jordan 1925, *Hoplopsyllus glacialis*

[1] Siphonaptera. A study of the species infesting wild hares and rabbits of North America north of Mexico, by Glen M. Kohls. National Institute of Health Bulletin No. 175. U. S. Government Printing Office, 1940. Available from the Superintendent of Documents, Washington, D. C., at 20 cents per copy.

glacialis (Tasch.) 1880, *H. glacialis lynx* (Baker) 1904, *H. affinis* (Baker) 1904, *H. fori* Ewing 1924, *Odontopsyllus multispinosus* (Baker) 1898, and *O. dentatus* (Baker) 1904.

All known collection records are listed, maps are presented showing localities where the several species have been collected, and the distributional range of each species as now known is discussed. A key and illustrations are given to aid in identifying the species. The occurrence of *Echidnophaga gallinacea* (West.) on wild hares and rabbits is reported and new States and counties are listed where *Pulex irritans L.* has been collected from these hosts. A brief section giving pertinent information relating to the wild hares and rabbits of the region concerned precedes the flea data.

DEATHS DURING WEEK ENDED APRIL 12, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 12, 1941	Corresponding week, 1940
Data from 88 large cities of the United States.		
Total deaths	8,528	8,693
Average for 3 prior years	8,748	
Total deaths, first 15 weeks of year	140,813	140,990
Deaths under 1 year of age	463	496
Average for 3 prior years	515	
Deaths under 1 year of age, first 15 weeks of year	8,039	7,754
Data from industrial insurance companies:		
Policies in force	64,566,401	65,810,905
Number of death claims	11,620	13,144
Death claims per 1,000 policies in force, annual rate	9.4	10.4
Death claims per 1,000 policies, first 15 weeks of year, annual rate	10.7	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 19, 1941

Summary

The number of cases of measles increased slightly during the current week, with a total of 53,593 cases reported as compared with 53,256 for the preceding week. The highest incidence rates were recorded for the Middle Atlantic, East North Central, and South Atlantic States—3,232, 3,154, and 2,649 (annual basis), respectively, per 100,000 population as compared with 2,105 for the country as a whole. The Pacific States, with a rate of 405, reported the lowest case rate. The same relative incidence was shown for these areas for the first quarter of the year.

To date this year (first 16 weeks) a total of 488,774 cases of measles has been reported in the United States, as compared with a 5-year (1936–40) median of 141,594 and with a total of 523,973 cases for the corresponding period of 1938, the year of highest incidence in the preceding 5 years.

The incidence of each of the 9 important communicable diseases included in the following weekly table, with the exception of scarlet fever, smallpox, and typhoid fever, was higher for the current week than for the corresponding period last year, but only influenza, measles, and whooping cough were above the 5-year (1936–40) median.

Of 35 cases of smallpox, 22 cases were reported in the two North Central areas and 8 cases in California. No State reported more than 2 of the 16 cases of poliomyelitis. Of 77 cases of typhoid fever, 51 cases occurred in the South Atlantic and two South Central areas. Eleven cases of Rocky Mountain spotted fever were reported, all in the northwest States, and 11 cases of endemic typhus fever, 1 of which occurred in Wisconsin, the remainder in the southern States.

Three cases of tularemia and 2 cases of undulant fever were reported.

The death rate for the current week for 88 major cities in the United States was 12.3 per 1,000 population, the same as the 3-year (1938–40) average. This is a slight increase over the rate of 11.9 for the preceding week.

Telegraphic morbidity reports from State health officers for the week ended April 19, 1941, and comparison with corresponding week of 1940 and 5-year median

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Apr. 19, 1941	Apr. 20, 1940		Apr. 19, 1941	Apr. 20, 1940		Apr. 19, 1941	Apr. 20, 1940		Apr. 19, 1941	Apr. 20, 1940	
NEW ENG.												
Maine	2	0	2	------	1	4	135	507	117	0	0	0
New Hampshire	0	0	0	------	------	------	72	30	26	0	0	0
Vermont	2	0	0	------	------	------	73	1	58	0	0	0
Massachusetts	2	2	2	------	------	------	746	513	621	1	0	2
Rhode Island	0	0	0	1	------	------	5	181	78	0	0	1
Connecticut	0	1	2	2	4	5	276	47	104	0	0	0
MID. ATL.												
New York	13	17	31	[1] 16	[1] 15	[1] 13	6,971	711	1,782	3	4	8
New Jersey	12	9	11	19	5	7	4,269	534	534	1	0	1
Pennsylvania	11	14	38	------	------	------	5,928	410	1,112	6	11	8
E. NO. CEN.												
Ohio	7	7	11	16	23	23	4,746	14	360	2	2	2
Indiana	10	4	9	11	24	24	1,487	25	25	0	0	1
Illinois	21	16	35	21	26	54	3,451	99	99	2	0	4
Michigan [2]	0	7	9	7	1	2	4,503	671	493	6	0	3
Wisconsin [3]	0	0	0	104	62	62	2,017	478	478	2	0	1
W. NO. CEN.												
Minnesota	0	1	1	2	4	2	24	170	292	0	1	1
Iowa	3	4	4	8	10	10	200	98	98	[4] 0	0	1
Missouri	3	7	7	5	8	45	518	45	45	1	0	1
North Dakota	2	0	1	6	2	7	32	1	2	1	0	0
South Dakota [5]	0	0	0	------	1	------	7	6	6	0	0	0
Nebraska	3	0	1	------	5	------	8	8	93	0	0	0
Kansas	7	11	3	11	8	8	1,084	638	47	1	0	0
SO. ATL.												
Delaware	0	0	1	------	------	------	208	5	6	0	0	0
Maryland [2]	2	4	2	9	5	10	378	18	255	4	1	2
Dist. of Col.	0	0	2	3	2	1	346	4	96	1	0	2
Virginia	7	9	9	324	224	224	2,589	131	457	4	1	2
West Virginia [2]	6	1	4	9	44	44	678	14	99	2	2	4
North Carolina	5	14	14	4	3	18	1,776	218	218	0	2	2
South Carolina [3]	4	10	5	448	416	388	1,365	8	35	1	1	1
Georgia	5	12	4	76	55	131	697	140	91	0	1	1
Florida [3]	0	0	2	117	8	7	1,145	107	107	0	0	0
E. SO. CEN.												
Kentucky	3	8	7	27	9	15	1,639	77	77	2	1	4
Tennessee	9	3	3	69	147	147	790	154	85	4	0	4
Alabama [3]	5	5	5	148	85	151	622	57	60	0	4	4
Mississippi [2]	4	2	2	------	------	------	------	------	------	2	0	1
W. SO. CEN.												
Arkansas	5	7	6	103	95	107	467	27	27	0	0	0
Louisiana [3]	3	5	11	14	9	15	70	9	15	0	1	3
Oklahoma	7	3	5	156	183	183	106	40	77	0	0	0
Texas [3]	37	16	29	933	555	564	2,197	1,140	418	2	6	4
MOUNTAIN												
Montana [5]	0	2	0	2	17	17	32	25	23	0	0	0
Idaho [5]	0	1	0	1	------	7	54	42	42	0	0	0
Wyoming [5]	0	2	0	------	------	------	74	23	11	0	0	0
Colorado [5]	10	6	7	42	6	------	522	35	35	0	0	0
New Mexico	2	0	3	2	------	2	264	41	49	0	1	1
Arizona [3]	4	2	2	84	122	119	104	151	144	0	0	0
Utah [2]	0	0	0	10	10	------	57	638	146	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	2	0	------	------	------	159	836	451	0	0	0
Oregon [5]	5	5	1	15	8	28	365	678	96	0	0	0
California	16	19	24	315	41	69	247	504	685	5	1	2
Total	238	238	355	8,140	2,243	2,243	53,593	10,309	12,898	53	40	64
16 weeks	4,596	5,723	8,084	579,891	157,526	134,670	488,774	106,305	141,594	[4] 791	654	1,359

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 19, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Apr. 19, 1941	Apr. 20, 1940		Apr. 19, 1941	Apr. 20, 1940		Apr. 19, 1941	Apr. 20, 1940		Apr. 19, 1941	Apr. 20, 1940	
NEW ENG.												
Maine	0	0	0	5	9	23	0	0	0	2	0	0
New Hampshire	0	0	0	4	4	6	0	0	0	0	0	0
Vermont	0	0	0	7	21	11	0	0	0	0	3	0
Massachusetts	1	0	0	152	173	245	0	0	0	0	0	1
Rhode Island	0	0	0	3	29	24	0	0	0	0	1	0
Connecticut	0	0	0	75	94	94	0	0	0	1	0	1
MID. ATL.												
New York	0	0	0	531	918	918	0	0	0	1	2	5
New Jersey	0	0	0	443	478	205	0	0	0	1	4	4
Pennsylvania	0	1	1	401	879	589	0	0	0	8	11	7
E. NO. CEN.												
Ohio	2	1	1	258	220	229	0	0	2	1	3	6
Indiana	0	0	0	154	181	181	0	1	19	0	1	1
Illinois	0	0	0	413	875	705	2	1	17	3	5	4
Michigan [2]	[6] 0	0	0	326	323	454	7	3	3	[6] 2	4	2
Wisconsin [3]	[7] 0	0	0	156	128	169	6	6	6	0	1	1
W. NO. CEN.												
Minnesota	1	1	0	41	80	102	3	3	10	0	0	0
Iowa	0	1	1	52	54	179	1	38	38	1	0	0
Missouri	0	0	0	130	85	86	1	1	27	1	2	2
North Dakota	0	0	0	5	11	30	1	2	12	0	2	1
South Dakota [4]	0	0	0	11	19	20	0	4	8	0	0	0
Nebraska	0	0	0	13	10	21	0	0	9	0	0	0
Kansas	1	1	0	47	50	111	1	1	20	0	1	1
SO. ATL.												
Delaware	0	0	0	8	15	10	0	0	0	0	0	0
Maryland [3]	0	0	0	50	22	58	0	0	0	0	1	1
Dist. of Col.	0	0	0	14	19	18	0	0	0	1	0	0
Virginia	1	0	0	20	49	33	0	0	0	3	1	1
West Virginia [2]	2	1	1	38	29	36	2	0	0	10	0	1
North Carolina	0	0	1	17	20	24	0	0	0	0	2	2
South Carolina [3]	0	2	0	11	5	3	1	0	0	0	1	1
Georgia	0	0	0	15	10	10	0	0	0	2	2	4
Florida [3]	1	0	0	9	5	5	0	0	0	6	1	3
E. SO. CEN.												
Kentucky	1	0	0	112	83	60	0	0	1	2	5	0
Tennessee	0	0	0	92	99	30	0	0	0	6	1	4
Alabama [3]	0	1	0	6	15	10	0	6	0	0	5	1
Mississippi [3]	0	0	1	1	7	3	0	1	1	1	3	1
W. SO. CEN.												
Arkansas	0	1	0	10	1	7	0	2	2	6	1	3
Louisiana [3]	0	0	0	5	6	9	0	1	0	4	3	6
Oklahoma	2	0	0	22	16	23	1	0	3	6	3	2
Texas [3]	2	1	2	50	35	59	0	6	7	4	10	7
MOUNTAIN												
Montana [5]	0	0	0	28	31	25	0	0	4	0	0	0
Idaho [5]	0	0	0	4	11	11	0	0	3	1	0	0
Wyoming [5]	0	0	0	11	3	5	0	0	0	0	0	0
Colorado [5]	0	0	0	36	30	47	0	7	6	0	0	1
New Mexico	0	0	0	8	12	16	0	0	0	0	2	2
Arizona [3]	0	0	0	5	8	8	0	0	0	0	2	1
Utah [2]	0	0	0	8	11	22	0	0	1	0	0	0
Nevada	0	-----	-----	0	-----	-----	0	-----	-----	0	-----	-----
PACIFIC												
Washington	1	0	0	24	46	39	1	0	3	2	1	1
Oregon [5]	0	0	0	5	11	30	8	0	11	0	0	0
California	1	2	2	102	141	173	0	3	11	2	6	7
Total	16	13	16	3,938	4,881	5,042	35	86	366	77	90	106
16 weeks	[6] [7] 389	401	326	59,716	76,587	95,816	706	1,161	5,097	[6] 1,206	1,255	1,751

See footnotes at end of table

Telegraphic morbidity reports from State health officers for the week ended April 19, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough	
	Week ended—	
	Apr. 19, 1941	Apr. 20, 1940
NEW ENG.		
Maine	45	19
New Hampshire	14	5
Vermont	22	23
Massachusetts	151	116
Rhode Island	10	7
Connecticut	44	25
MID. ATL.		
New York	230	442
New Jersey	102	105
Pennsylvania	318	265
E. NO. CEN.		
Ohio	284	187
Indiana	45	36
Illinois	84	104
Michigan [2]	336	181
Wisconsin [3]	100	77
W. NO. CEN.		
Minnesota	119	38
Iowa	25	32
Missouri	42	22
North Dakota	23	2
South Dakota [5]	50	4
Nebraska	33	2
Kansas	105	20
SO. ATL.		
Delaware	2	14
Maryland [2]	81	147
Dist of Col	13	7
Virginia	110	91
West Virginia [2]	46	38
North Carolina	223	92
South Carolina [3]	246	33
SO. ATL.—continued		
Georgia	39	23
Florida [3]	19	6
E. SO. CEN.		
Kentucky	110	80
Tennessee	62	33
Alabama [3]	34	22
Mississippi [2]	----------	----------
W. SO. CEN.		
Arkansas	13	11
Louisiana [3]	10	9
Oklahoma	45	22
Texas [3]	337	203
MOUNTAIN		
Montana [5]	5	5
Idaho [5]	1	10
Wyoming [5]	1	4
Colorado [5]	201	18
New Mexico	8	21
Arizona [3]	26	36
Utah [2]	73	97
Nevada	0	----------
PACIFIC		
Washington	120	67
Oregon [5]	21	53
California	612	418
Total	4, 640	3, 362
16 weeks	69, 697	48, 330

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Apr. 19, 1941, 11 cases as follows: Wisconsin, 1; South Carolina, 1; Florida, 3; Alabama, 2; Louisiana, 1; Texas, 2; Arizona, 1.
[4] Information has been received that of 5 cases of meningitis reported in Iowa thus far in 1941, only 1 case, that reported for the week ended Apr. 12, was meningococcus meningitis.
[5] Rocky Mountain spotted fever, week ended Apr. 19, 1941, 11 cases as follows: South Dakota, 1; Montana, 3; Idaho, 1; Wyoming, 3; Colorado, 2; Oregon, 1.
[6] A delayed report has been received of 1 case of poliomyelitis and 2 cases of typhoid fever in Michigan for the week ended Mar. 29, 1941.
[7] Information has been received from Wisconsin that the report of 17 cases of poliomyelitis for the week ended Jan. 4, 1941, was a delayed report of cases occurring in 1940, and that only 6 cases occurred in January instead of the 7 additional cases reported.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 5, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	117	349	89	5,609	738	2,146	22	388	20	1,182	
Current week [1]	62	247	29	19,763	466	1,551	0	324	18	1,192	
Maine:											
Portland	0		0	0	4	2	0	0	0	2	20
New Hampshire:											
Concord	0		0	0	0	0	0	0	0	0	14
Nashua	0		0	0	0	0	0	0	0	4	3
Vermont:											
Barre	0		0	0	0	0	0	0	0	0	1
Burlington	0		0	0	0	1	0	0	0	0	8
Rutland	0		0	0	2	0	0	0	0	0	6
Massachusetts:											
Boston	0		0	250	9	88	0	11	0	56	220
Fall River	0		0	3	2	4	0	2	0	0	28
Springfield	2		0	3	0	14	0	1	0	1	55
Worcester	0		0	26	11	15	0	2	0	0	72
Rhode Island:											
Pawtucket	0		0	0	0	1	0	0	0	0	17
Providence	0		0	4	5	4	0	3	0	26	70
Connecticut:											
Bridgeport	0	1	0	5	2	7	0	2	0	0	37
Hartford	0		0	5	1	6	0	0	1	1	42
New Haven	0	1	0	3	0	25	0	0	1	9	38
New York:											
Buffalo	0		0	92	3	47	0	11	0	10	118
New York	17	24	3	6,560	103	332	0	74	1	108	1,536
Rochester	0		0	81	1	6	0	1	0	11	80
Syracuse	0		0	0	0	2	0	0	0	10	46
New Jersey:											
Camden	2	2	0	20	2	20	0	1	0	4	38
Newark	0		0	240	2	40	0	4	0	13	103
Trenton	0		0	34	2	41	0	2	1	0	33
Pennsylvania:											
Philadelphia	0	2	1	1,617	19	95	0	30	1	38	499
Pittsburgh	1	3	1	270	14	17	0	7	0	53	174
Reading	0		0	114	1	2	0	1	0	2	34
Scranton	0			23		0	0		0	1	
Ohio:											
Cincinnati	0		0	669	4	16	0	2	0	5	109
Cleveland	0	13	1	2,817	10	43	0	9	0	66	215
Columbus	0	1	1	219	6	23	0	2	1	27	94
Toledo	0		2	98	3	13	0	4	0	18	
Indiana:											
Anderson	0		0	3	3	0	0	0	0	0	12
Fort Wayne	0		0	78	1	2	0	0	0	3	25
Indianapolis	2		2	368	14	19	0	6	0	7	111
Muncie	0		0	59	0	15	0	1	0	0	10
South Bend	0		0	52	0	0	0	0	0	0	20
Terre Haute	0		0	1	1	0	0	0	0	0	16
Illinois:											
Chicago	8	2	3	1,509	26	205	0	32	0	30	701
Elgin	0		0	290	0	0	0	0	0	0	8
Moline	0		0	15	1	1	0	0	0	0	4
Springfield	0		0	2	3	3	0	0	0	0	34
Michigan:											
Detroit	1	1	0	1,151	15	155	0	13	2	128	254
Flint	0		0	191	2	4	0	0	0	19	19
Grand Rapids	1		0	574	2	5	0	0	0	10	32
Wisconsin:											
Kenosha	0		0	153	0	1	0	0	0	1	5
Madison	0		0	26	2	10	0	0	0	1	9
Milwaukee	0		0	310	5	26	0	0	0	26	90
Racine	0		0	16	0	3	0	0	0	3	17
Superior	0		0	1	0	1	0	0	0	2	10
Minnesota:											
Duluth	0		1	0	4	1	0	1	0	12	26
Minneapolis	1		0	2	8	12	0	1	0	35	105
St. Paul	0		0	1	4	11	0	2	0	12	63

[1] Figures for Wilmington, N. C., Tampa, Little Rock, and Boise estimated; reports not received.

City reports for week ended April 5, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	------	------	10	------	3	0	------	0	0	------
Davenport	0	------	------	4	------	1	0	------	0	0	------
Des Moines	0	------	------	0	------	5	0	------	0	4	39
Sioux City	1	------	------	6	------	2	0	------	1	4	------
Waterloo	0	------	------	50	------	1	0	------	0	2	------
Missouri:											
Kansas City	0	------	0	52	10	9	0	5	0	18	94
St. Joseph	0	------	0	17	5	1	0	0	0	1	31
St. Louis	1	------	0	217	13	101	0	5	0	37	212
North Dakota:											
Fargo	0	------	0	0	0	1	0	0	0	10	7
Grand Forks	0	------	------	1	------	0	0	------	0	1	------
Minot	1	------	------	6	------	1	0	------	0	0	8
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	1	------
Nebraska:											
Lincoln	0	------	------	3	------	5	0	------	0	2	------
Omaha	0	------	0	3	4	6	0	1	0	1	48
Kansas:											
Lawrence	0	5	0	48	2	0	0	0	0	0	8
Topeka	0	------	0	240	4	1	0	0	0	7	35
Wichita	0	------	0	2	1	1	0	2	0	19	29
Delaware:											
Wilmington	0	------	0	130	6	4	0	0	0	0	19
Maryland:											
Baltimore	1	12	3	93	16	19	0	12	1	50	235
Cumberland	0	------	0	2	0	0	0	0	0	0	12
Frederick	0	------	0	0	2	0	0	0	0	0	3
Dist. of Col.:											
Washington	1	3	0	328	9	14	0	5	0	18	169
Virginia:											
Lynchburg	0	------	0	6	2	0	0	1	0	0	9
Norfolk	0	32	0	243	2	3	0	1	1	1	23
Richmond	0	------	0	43	3	0	0	2	0	0	49
Roanoke	0	------	0	106	2	2	0	0	0	2	13
West Virginia:											
Charleston	0	------	0	5	0	0	0	0	0	0	19
Huntington	0	------	------	77	------	0	0	------	0	4	------
Wheeling	0	------	0	15	3	2	0	0	0	5	16
North Carolina:											
Gastonia	0	------	------	41	------	0	0	------	0	4	------
Raleigh	0	------	0	191	1	0	0	0	0	23	13
Wilmington	------	------	------	------	------	------	------	------	------	------	------
Winston-Salem	0	4	0	38	1	1	0	2	0	19	19
South Carolina:											
Charleston	0	12	1	84	2	0	0	0	7	0	27
Florence	0	8	0	3	5	0	0	0	0	0	24
Greenville	0	------	0	78	2	0	0	0	0	5	10
Georgia:											
Atlanta	2	------	1	23	6	4	0	4	0	2	67
Brunswick	0	------	0	79	1	0	0	0	0	0	6
Savannah	0	14	2	9	1	1	0	2	0	0	35
Florida:											
Miami	0	2	0	16	0	1	0	0	0	3	31
Tampa	------	------	------	------	------	------	------	------	------	------	------
Kentucky:											
Ashland	0	------	0	3	2	0	0	1	0	0	16
Lexington	0	------	0	1	1	0	0	2	0	0	19
Tennessee:											
Knoxville	0	------	0	73	1	4	0	1	0	8	27
Memphis	0	5	1	132	5	3	0	0	0	17	88
Nashville	0	------	1	93	4	7	0	1	0	5	43
Alabama:											
Birmingham	1	5	0	42	11	3	0	0	0	3	72
Mobile	1	3	0	3	2	1	0	0	0	0	27
Montgomery	0	------	------	21	------	0	0	------	0	2	------
Arkansas:											
Fort Smith	0	1	------	20	------	1	0	------	0	0	------
Little Rock	------	------	------	------	------	------	------	------	------	------	------
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	3
New Orleans	2	5	2	0	11	4	0	8	0	2	116
Shreveport	0	------	0	3	3	0	0	0	0	0	43

City reports for week ended April 5, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	10	-------	3	2	9	0	2	0	0	36
Tulsa	1	0	-------	92	4	0	0	0	0	10	30
Texas:											
Dallas	2	2	2	56	6	4	0	3	0	2	71
Fort Worth	1	-------	0	168	5	5	0	0	2	4	39
Galveston	0	-------	0	1	1	1	0	2	0	0	16
Houston	2	3	1	1	9	5	0	8	0	0	89
San Antonio	0	6	0	1	8	1	0	5	0	8	60
Montana:											
Billings	0	-------	0	0	1	0	0	0	0	0	8
Great Falls	0	-------	0	1	0	1	0	0	0	0	13
Helena	0	-------	0	1	0	1	0	0	0	0	1
Missoula	0	-------	0	0	0	1	0	0	0	0	3
Idaho:											
Boise	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Colorado:											
Colorado Springs	0	-------	0	0	0	2	0	1	0	3	8
Denver	5	-------	0	209	5	4	0	6	0	65	91
Pueblo	0	-------	0	4	1	0	0	0	0	20	7
New Mexico:											
Albuquerque	0	-------	0	30	1	2	0	4	0	0	19
Utah:											
Salt Lake City	0	-------	0	5	0	1	0	0	0	15	37
Washington:											
Seattle	0	-------	0	0	7	4	0	1	1	11	94
Spokane	0	-------	0	8	1	2	0	0	0	0	19
Tacoma	0	-------	1	4	2	0	0	0	1	11	41
Oregon:											
Portland	0	2	-------	13	4	1	0	2	0	0	79
Salem	0	1	-------	0	-------	0	0	-------	0	1	-------
California:											
Los Angeles	6	25	0	39	11	28	0	19	0	42	327
Sacramento	2	2	0	10	3	9	0	1	0	10	26
San Francisco	0	82	0	8	3	4	0	8	0	30	186

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				South Carolina:			
Worcester	1	1	0	Charleston	1	0	0
New York:				Florida:			
New York	4	0	1	Miami	0	0	3
Pennsylvania				Tennessee:			
Pittsburgh	1	1	0	Knoxville	1	0	0
Maryland:				Louisiana.			
Baltimore	3	0	0	Shreveport	0	2	0
District of Columbia:				Oregon:			
Washington	1	0	0	Portland	1	0	0
Virginia:							
Norfolk	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: Boston, 1; Bridgeport, 1; New York, 1; Flint, 1; Los Angeles, 1 (equine). Deaths: New York, 1; St. Joseph, 2.

Pellagra.—Cases: Wichita, 1; Birmingham, 1.

Typhus fever.—Cases: New York 1; Miami, 1; New Orleans 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 15, 1941.—During the week ended March 15, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		5	2	9	13	2	1	1	4	37
Chickenpox		5	21	136	242	26	13	7	89	539
Diphtheria	3	11		10		1	1			26
Influenza		27			20	3			29	79
Measles		163	50	465	912	127	196	175	1,329	3,417
Mumps		3		298	250	35	27	25	32	670
Pneumonia		20			12	1	10		3	46
Poliomyelitis				1	1					2
Scarlet fever		34	10	123	209	14	5	18	18	431
Smallpox							1			1
Tuberculosis	1	10	7	78	47	3	22	1		169
Typhoid and paratyphoid fever				7	1					8
Whooping cough		3	10	72	113		24	12	31	265

SWEDEN

Notifiable diseases—January 1941.—During the month of January 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	7	Poliomyelitis	15
Diphtheria	29	Scarlet fever	913
Dysentery	3	Syphilis	24
Gonorrhea	786	Typhoid fever	2
Lethargic encephalitis	1	Undulant fever	4
Paratyphoid fever	10	Weil's disease	2

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-December, 1940	January-February, 1941	March 1941—week ended— 1	8	15	22	29
ASIA								
Ceylon	C	1						
China	D	[1] 41,181						
Dairen	C	2						
Foochow	C	625						
Hong Kong	C	867	18	7	24			
Macao	C	513						
Manchuria	C	31						
Shanghai	C	571						
Shantung Province	C	244						
India	C	[2] 43,094						
Bassein	C	104						
Bombay	C	13						
Calcutta	C	2,434	276					
Cawnpore	C	333						
Chittagong	C	4						
Karachi	C	65						
Madras	C	1						
Moulmein	C	16						
Porto Novo	C	1						
Rangoon	C	61						
Vizagapatam	C	21						
India (French)	C	34						
Indochina (French)	C	436						
Thailand	C	235						

[1] From the middle of June to the end of August 1940.
[2] January to August 10, 1940.

PLAGUE

[C indicates cases; D, deaths]

AFRICA								
Algeria	C	23						
Plague-infected rats		2						
Belgian Congo	C	26	1					
British East Africa:								
Kenya	C	9	3					
Uganda	C	277	23					
Egypt	C	[1] 409						
Madagascar	C	598	103					[2] 69
Morocco	C	1,099	375	44	57	35	35	71
Rhodesia, Northern	C	1						
Senegal:								
Dakar	D	[3] 1						
Thies	C	1						
Tivaouane	C	3						
Tunisia: Tunis	C	10	2					
Plague-infected rats		1						
Union of South Africa	C	[4] 37	13	2				

[1] Includes 5 cases of pneumonic plague.
[2] For the month of March 1941.
[3] Imported.
[4] Includes 6 cases of pneumonic plague.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths]

Place		January-December, 1940	January-February, 1941	March 1941—week ended—1	8	15	22	29
ASIA								
China: [5]								
Dutch East Indies:								
Java and Madura	C	378						
West Java	C	8						
India	C	[6] 14,438						
Bassein	C	18						
Cochin	C	1						
Plague-infected rats		5						
Rangoon	C	6	2					
Indochina (French)	C	5						
Thailand:								
Bangkok	C	3						
Plague-infected rats		2						
Bisnulok Province	C	3						
Chingmai	C	3						
Dhonpuri Province	C	1						
Jayanad Province	C	3						
Kamphaeng Bajr Province	C	29						
Kanchanapuri Province	C	12						
Koan Kaen Province	C	5						
Nagara Svarga Province	C	30						
Noangkhay Province	C	4						
Sukhodaya Province	C	22						
EUROPE								
Portugal. Azores Islands	C	4						
SOUTH AMERICA								
Argentina								
Catamarca Province	C	10						
Cordoba Province	C	[7] 54	1					
Jujuy Province	C	9						
La Pampa Territory	C	1						
La Rioja Province	C	1						
Salta Province	C	8						
San Luis Province	C	2						
Santiago del Estero Province	C	85						
Tucuman Province	C	21						
Brazil								
Alagoas State	C	9						
Pernambuco State	C	4						
Ecuador: El Oro Province	C	6						
Peru:								
Cajabamba Department	C	1						
Cajamarca Department	C	28						
Lambayeque Department	C	15	1					
Libertad Department	C	53	5					
Lima Department	C	57	2					
Piura Department	C	9						
Tumbes Department	C	[8] 21						
OCEANIA								
Hawaii Territory: Plague-infected rats		[9] 54	7			1	1	1
New Caledonia	C		7					

[5] Information dated July 7, 1940, states that up to July 6, 17 cases of plague had been reported near Tungliao, Hsingan Province, China; and a report dated July 13 states that an outbreak of bubonic plague occurred along the Yunnan-Burma border in the districts of Loiwing, Chefang, Juili, and Muchieh. Information dated Aug. 17 states that 45 cases of plague with 36 deaths have occurred in Nungen District and a telegram dated Oct. 2 states that 15 cases of bubonic plague with 3 deaths occurred in Hsinking, Manchuria. During the week ended Nov. 16, 1940, an epidemic of bubonic plague was reported in Ningpo District, Chekiang Province, China.

[6] January to August 10, 1940.

[7] Includes 15 cases of pneumonic plague.

[8] Includes 3 suspected cases.

[9] During the week ended Dec. 7, a positive mass inoculation of 12 rats and 1 mouse was also reported.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths]

Place		January-December, 1940	January-February, 1941	March 1941—week ended—				
				1	8	15	22	29
AFRICA								
Algeria	C	6	38		5			
Angola	C	271						
Belgian Congo	C	4,765						
British East Africa	C	59	7					
Dahomey	C	89	270		1		47	
French Guinea	C	16	11		8			
Gibraltar	C	[1] 1						
Ivory Coast	C	132	15				6	
Morocco	C	103	27					
Nigeria	C	2,319	83					
Niger Territory	C	664	52				40	
Nyasaland	C	75						
Portuguese East Africa	C	1						
Rhodesia:								
Northern	C	6						
Southern	C	259	62	18				
Senegal	C	160	18		10			
Sierra Leone	C	10						
Sudan (Anglo-Egyptian)	C	535	1					
Sudan (French)	C	3	10		4			
Union of South Africa	C	180						
ASIA								
Arabia	C	255						
China	C	981	69		2	2	3	1
Chosen	C	720						
Dutch East Indies—Sabang	C	4						
India	C	[2] 154,740						
India (French)	C	5						
India (Portuguese)	C	20						
Indochina (French)	C	1,572	155		50			38
Iran	C	177	4					
Iraq	C	935	528	63	74			
Japan	C	502	80	12				
Straits Settlements	C	1						
Sumatra	C	1						
Syria	C			1				
Thailand	C	209	70			1	1	3
EUROPE								
France	C	[3] 4	1					
Great Britain	C	2						
Greece	C	23						
Portugal	C	504	5					
Spain	C	1,090	95					
Turkey	C	139						
NORTH AMERICA								
Canada	C	17	1			1	1	
Guatemala	C	35	3					
Mexico	C	61	18					
SOUTH AMERICA								
Bolivia	C	352						
Brazil	C	5						
Colombia	C	1,990	127					
Ecuador	C	1						
Peru	C	245						
Venezuela (alastrim)	C	224	34					

[1] Imported.
[2] January to August 10, 1940.
[3] For the month of June 1940.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January–December, 1940	January–February, 1941	March 1941—week ended—				
				1	8	15	22	29
AFRICA								
Algeria	C	2,146	807		270			
Belgian Congo	C	1,210						
British East Africa	C	2						
Egypt	C	3,636						
Eritrea	C	63						
Morocco	C	355	29	12	12	33	29	24
Rhodesia, Northern	C	7						
Tunisia	C	651	418		94	168	132	
Union of South Africa	C	298	11					
ASIA								
China	C	2,191	31	3				
Chosen	C	359						
India	C	3						
Indochina (French)	C	2						
Iran	C	256	1					
Iraq	C	159	5	1	3			
Japan	C	2						
Palestine	C	203						
Straits Settlements	C	15	2					
Sumatra	C	[1] 196						
Trans-Jordan	C	15						
EUROPE								
Bulgaria	C	155	39	11	5	3	4	9
France	C	1						
Germany	C	230	209	29	40	41		
Greece	C	43	7					
Hungary	C	93	40		7	22		22
Irish Free State	C	10	1					
Lithuania	C	115						
Rumania	C	1,403	337	22	25	35		20
Spain [2]	C	14						
Turkey	C	716	91					
Yugoslavia	C	282	50					
NORTH AMERICA								
Guatemala	C	309	62					
Mexico	C	219						
Panama Canal Zone	C	3	1					
Salvador	C	1						
SOUTH AMERICA								
Bolivia	C	733						
Chile	C	430						
Ecuador	C	2	21					
Peru	C	1,256						
Venezuela	C	14	17					
OCEANIA								
Australia	C	12	3					
Hawaii Territory	C	28	2			1		

[1] For the period May to August 1940, inclusive.
[2] For the period Feb. 2 to Apr. 5, 1941, 426 cases of typhus fever were reported in Spain, including 300 cases reported in Madrid Province.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-December, 1940	January-February, 1941	March 1941—week ended—				
				1	8	15	22	29
AFRICA								
Belgian Congo: Yatolet	C	1						
Cameroon: Nkongsamba	C	[1] 1						
French Equatorial Africa	C	[1] 1				1		1
Gold Coast	C	1						
Ivory Coast	C	[2] 6	[3] 3					
Nigeria:								
Ibadan	C	1						
Oshogbo	C	[1] 1						
Sudan (Anglo-Egyptian): Kordofan Province [4]	C	858						
Sudan (French): Segou	C	[1] 1						
Togo (French)	C	1						
SOUTH AMERICA [5]								
Bolivia: Beni Department	C	1						
Brazil:								
Bahia State	D	1						
Espirito Santo State	D	140						
Minas Geraes State	D	2						
Para State	D	1						
Rio de Janeiro State	D	5						
Santa Catarina State	D	2						
Colombia:								
Antioquia Department—San Luis	D	2						
Boyaca Department	D		3					
Caldas Department—								
La Pradera	D	1						
Samana	D	1						
Victoria	D	1						
Cundinamarca Department	D	2						
Intendencias and Commissaries	C	5						
Meta Department	D	7	1					
Municipality of Jesus Maria	D	1						
Santander Department	D	3	2					
Tolima Department	D	12	1					

[1] Suspected.
[2] Includes 4 suspected cases.
[3] Includes 2 suspected cases.
[4] A report dated Nov. 13, 1940, also states that 8,000 cases of yellow fever with 800 deaths have been reported in Kordofan Province, Anglo-Egyptian Sudan.
[5] All yellow fever reported in South American countries is jungle type unless otherwise specified.

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Public Health Reports

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

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Public Health Reports

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HOW HEALTH DEPARTMENTS FUNCTION WITH RESPECT TO SPECIFIC PROBLEMS [1]

By J. O. DEAN, *Passed Assistant Surgeon*, and EVELYN FLOOK, *United States Public Health Service*

INTRODUCTION

One of the most challenging aspects of public health administration is the lack of uniformity with which health departments, organized along basically similar lines, function in respect to specific problems. Unfortunately, the extent to which this chaotic state of disagreement exists in the various realms of public health work is not fully appreciated. It is believed, however, that information obtained from the records of three representative rural health departments and analyzed by this office is sufficiently impressive to awaken public health administrators to the desirability of critically evaluating the various prevailing practices before any are applied locally. That the numerous, widely differing policies now employed in solving any common problem cannot be equally effective is obvious.

In two previous articles of this series,[2] these three representative rural health departments, designated as A, B, and C, were analyzed as to organization, volume and distribution of services, and the extent to which various staff members coordinate their activities. This paper presents an analysis of their practices in handling outstanding public health problems.

The study is based upon population units of approximately 26,500 in County A, 55,000 in County B, and 41,000 in the rural sections of County C. The county seat (population 85,000) of the last named was excluded because it has its own city health department.

The greater part of the study area is rural and agricultural, although about one-half of the population resides in communities unincorporated but located in part on the outskirts of a city. Consequently, the

[1] From the Division of Public Health Methods, National Institute of Health, in cooperation with the Division of Domestic Quarantine.

[2] Mountin, Joseph W., and Flook, Evelyn: The scope of personal service rendered by three representative health departments. The Health Officer. November 1939.

Dean, J. O., and Flook, Evelyn: Neglected opportunities for teamwork in county health department practice. Pub. Health Rep., 55: 573 (April 5, 1940).

public health problems involved come from both rural and, in all but name, urban living conditions.

The three counties have other similar features. The population is predominantly white, the highest Negro representation being 19 percent in County A. Each of the counties is above the average of its State in wealth, although County A is below the average for the country as a whole. All three have about the same type of health department. From these characteristics in common one would be inclined to look for a decided similarity in health department policies and procedures for the handling of specific health problems. On the contrary, the striking dissimilarity found in respect to outstanding public health problems is marked enough to warrant extensive consideration.

CONTROL OF COMMUNICABLE DISEASE

Programs adopted by the three counties for the control of communicable disease represent the first major difference found. Even such universally recommended procedures as punctual investigation by the health department of reported cases, isolation of patient and contacts, and provision of immunity against certain specific conditions were not followed with any noticeable degree of comparability. The need of a common policy with regard to selecting communicable disease cases to be visited is well illustrated by the striking differences observed. Health department supervision of cases received little emphasis in County B, as is apparent from the fact that only 90 of the 1,497 cases of known communicable illness were visited by health department personnel. (See table 1.) Diphtheria, scarlet and typhoid fevers, and such less frequent diseases as undulant and Rocky Mountain spotted fevers were the conditions regularly included in the health department's visiting program. Indeed, it would appear that even among these, only about three-fifths of the known diphtheria and scarlet fever cases in this county actually received health department attention. Whenever dairy farms were affected, however, strict supervision was maintained.

County C's visiting policy offers a marked contrast to that of County B. In all, 3,786 cases of communicable disease were visited during the study year by some representative of the health department in County C. Conditions listed for visiting were not restricted to those of a relatively serious nature as was the case in County B. In fact, visits were made to 98 percent of the aggregate number of communicable disease cases which came to the attention of County C's health department.

TABLE 1.—*Number of cases of certain acute communicable diseases known to the health departments of three selected counties and number of those cases visited by some member of the health department staff*

Disease	County A		County B		County C	
	Cases known to the health department	Cases visited	Cases known to the health department	Cases visited	Cases known to the health department	Cases visited
Total for the diseases listed	1,245	227	1,497	90	3,873	3,786
Chickenpox	27	6	66		119	105
Conjunctivitis	[1] 5	5	[1] 1	1	[1] 26	26
Diarrhea and dysentery	32	8	12		[1] 2	2
Diphtheria	18	17	37	21	90	82
Erysipelas	(1)		1		[1] 1	1
German measles	[1] 1	1	6		1	
Influenza	78	1	78		9	9
Intestinal parasites	[1] 9	9	(1)		[1] 2	2
Malaria	1		1	1	[1] 6	6
Measles	803	85	962	10	3,291	3,245
Mumps	40	16	63		[1] 7	7
Pneumonia	81	12	99		[1] 8	8
Poliomyelitis	2	1	1		3	3
Rocky Mountain spotted fever	6	6	8	2	1	1
Scarlet fever	50	43	84	51	140	127
Septic sore throat	[1] 2	2	2			
Smallpox	1	1				
Typhoid and paratyphoid fever	9	6	3	3	15	13
Undulant fever			3	1	1	
Whooping cough	80	8	70		151	149

[1] Not reportable—discovered in the nurse's routine visiting or because health department aid was requested.

County A pursued an intermediate course in the matter of visiting communicable disease cases. The list selected for intensive control measures was limited, but a concentrated effort was made to visit all cases of those particular conditions. Records indicate that the organization met with considerable success in attaining this goal. A total of 227 cases were brought under health department surveillance.

Further evidence of diversity in the method of communicable disease control employed by the three counties is found in the type of service which was recorded for each family. According to table 2, the chief purpose of health department contact in County C was to impose regulatory measures upon the household. Under this heading are included isolating, quarantining, placarding, or the excluding from school of cases, contacts, or suspects. On the other hand, these control measures appear to have been regarded as relatively unimportant in County B. Investigation of reported cases represented the most frequent purpose for visiting communicable disease situations in this county. This difference in quarantine policy is even more accentuated when it is recalled that most of the illnesses visited by the health department in County B were of the graver types. The practice of County A's health department with regard to quarantine seems to represent middle ground between that of the other two counties.

TABLE 2.—*Type of service rendered by health department personnel of three selected counties on the first visit to households seen solely for communicable disease*

Type of service rendered	Number of households which received designated service on first visit of health department personnel		
	County A	County B	County C
Total [1]	147	[2] 101	1,775
Impose restrictive measures	64	16	1,540
Diagnose condition or give medical treatment	30	5	38
Give nursing instructions concerning communicable disease	14	12	23
Investigate reported case	14	46	99
Collect laboratory specimens or cultures	7	10	15
Do bedside nursing	5	2	3
Terminate restrictive measures	3	1	2
Conduct typhoid investigation	2		
Inspect condition of child in school		1	
Investigate school absenteeism			23
Transfer patient to hospital			4
Type of service unknown	8	8	28

[1] Seventeen households of County A and 4 of County C were omitted from this tabulation because the health department service rendered was not exclusively for communicable disease.
[2] Only 90 cases were involved in these 101 households. Presence of contacts accounts for visits to those homes without cases.

County B provided diagnosis and/or medical treatment less frequently that did either of the other areas. Nursing instructions concerning care of communicable disease patients were given for a higher proportion of the situations visited in A and B than in C. In no county was bedside nursing an appreciable part of the control program.

An instance of striking diversity in classification by the three organizations lies in the proportion of cases reported as having complications. Ninety-five percent of the cases visited by health department workers of County C were placed in this category, whereas only one-fourth of those visited in County B and one-twelfth in County A were so classified. These figures no doubt reflect, in some measure, the disease receiving predominant health department attention in each county, for it is recognized that complications are more apt to develop from some diseases than from others. In view of the extreme differences, however, the variance reported obviously represents, in part at least, different interpretations of the term "complications."

At the time of this study the Committee on Administrative Practice [3] recommended two release cultures as standard laboratory procedure in the supervision of both diphtheria and typhoid fever cases. With a goal so definitely stated it seems odd that laboratory service provided by the three health departments was almost exclusively for diphtheria, and even for this disease no regularity of practice was demonstrated, either in proportion of patients cultured or in

[3] The Committee on Administrative Practice. Appraisal Form for Rural Health Work. American Public Health Association, New York, 1932.

number of cultures made per patient. Throat or nose and throat cultures were taken for all but one diphtheria case visited in County A, for seven-eighths of the number supervised in County C, and for more than one-half of those under observation in County B. In each county the number of such cultures made per patient fell somewhat short of standard practice. According to the records, the organizations also varied in their methods of making diphtheria cultures. Health Department A reported throat cultures only; Health Department B stated that all cultures were from both nose and throat and Health Department C reported that its practice varied. None of the departments met standard requirements for the release of typhoid fever cases. The number of communicable disease patients for whom immune serum was supplied by the health department was inconsequential. When such service was provided it was usually for cases recorded as having complications.

Absence of a common pattern of control was not restricted to supervision of cases. Procedures followed with respect to contacts, suspects, and carriers also differed widely. Although the aggregate number of such persons visited was approximately the same in each county, the variations were marked in relation to the number of cases admitted to service. From this standpoint, Health Department C paid little attention to contacts, suspects, or carriers. On the contrary, Department B placed greater emphasis upon such control than upon supervision of cases. Diphtheria, scarlet fever, and typhoid fever represent the particular conditions for which supervision of contacts, suspects, or carriers was given in all areas.

Still another dissimilarity in operation of the three health departments is manifest in the duration of the supervisory periods maintained over households with communicable disease. Table 4 shows that less than one-half of the situations supervised by Department B received more than a single visit, whereas in County C 75 percent were observed for an extended period varying from 1 day to more than 3 weeks. Health Department A occupied an intermediate position. Not only did a higher percentage of situations in County C receive extended supervision, but the sustained period of observation was also longer in this county. The median length of time between the first and last visits of the health department was 11.3 days in County B, 16.3 days in County A, and 18 days in County C. These medians, of course, are based upon only those situations which received more than one visit.

TABLE 3.—*Number of cases of certain acute communicable diseases visited by the health departments of three selected counties, and number of additional persons visited as contacts, suspects, or carriers of the specified diseases*

Disease	County A		County B		County C	
	Cases	Contacts, suspects, and carriers	Cases	Contacts, suspects, and carriers	Cases	Contacts, suspects, and carriers
Total for the diseases listed	227	183	90	207	3,786	177
Chickenpox	6				105	9
Conjunctivitis	5		1		26	
Diarrhea and dysentery	8				2	
Diphtheria	17	58	21	93	82	66
Erysipelas					1	
German measles	1					
Influenza	1				9	
Intestinal parasites	9	3			2	
Malaria			1		6	18
Measles	85	8	10	1	3,245	31
Meningitis						1
Mumps	16	3			7	1
Pneumonia	12			1	8	
Poliomyelitis	1	1			3	1
Rabies						7
Rocky Mountain spotted fever	6	2	2		1	
Scarlet fever	43	66	51	104	127	22
Septic sore throat	2					
Smallpox	1	8				
Typhoid and paratyphoid fever	6	31	3	8	13	23
Undulant fever			1			
Whooping cough	8	3			149	3

TABLE 4.—*Distribution of households visited for the control of communicable disease by health department personnel of three selected counties according to length of the supervisory period maintained by the health department*

Period of supervision	County A		County B		County C	
	Number of households supervised for specified period	Percent of households supervised for specified period	Number of households supervised for specified period	Percent of households supervised for specified period	Number of households supervised for specified period	Percent of households supervised for specified period
Total	164	100.0	101	100.0	1,779	100.0
No extended period (1 visit only)	70	42.7	57	56.4	438	24.6
1–6 days	16	9.8	17	16.8	56	3.1
7–12 days	16	9.8	7	6.9	280	15.8
13–18 days	24	14.6	2	2.0	334	18.8
19–24 days	24	14.6	5	5.0	336	18.9
Over 24 days	14	8.5	13	12.9	335	18.8

Service for the situations which received no return visits was predominantly the investigation of reported cases and the placing of standard restrictive measures upon the household. Where the interval of time between the first and last visit was prolonged the last visit was chiefly for the purposes of terminating restrictions, giving instructions concerning communicable diseases, or checking up on patients after expiration of the quarantine period. The last-named purpose applied to only one department, since only in County C was attention extended beyond the termination of quarantine.

Most States require that all known cases of certain communicable diseases shall be reported by local authorities to the State health department. When actual names of persons attended by health department personnel for selected conditions[4] were compared with the names of those reported to the State organization, it was found that 98 percent of the cases served by Health Department B were reported to the State; in County A only 55 percent of a similar group were reported; and in County C the corresponding percentage dropped to 26. Thus it is evident that considerable variation existed among the three departments with regard to thoroughness of reporting—a further indication of the absence of a singleness of regimen in communicable disease control activities. It should be noted that in each area the comparatively serious diseases, such as diphtheria and scarlet fever, were more consistently reported to the State than those of minor character.

CONTROL OF TUBERCULOSIS

Conformity to a single policy is as nonexistent in the tuberculosis programs adopted by the health departments under consideration as in their activities for control of the acute communicable diseases.

The tuberculosis file of Health Department B was compiled from disease and death reports of private physicians, cases discovered in the conduct of chest clinics, referred reports of some of the sanatoria on discharge of patients, reports of welfare workers or teachers, and requests for health department aid from tuberculosis patients or their relatives. County A's register was composed almost entirely of cases reported by private physicians and those discovered in the course of clinic examinations. The file of County C was made up of patients referred by physicians to the out-patient department of the sanatorium for confirmation of diagnosis. Because of this single source of information it is not surprising to find that all of the cases known to the authorities of County C were examined during the study year, while only two-thirds of those registered in County B and less than one-half of those in County A received examination.

In County C, where sanatorium facilities were available within the area, the case was usually hospitalized. While it is true that neither County A nor County B had local tuberculosis hospital facilities, residents of both counties were eligible for admission to their respective State sanatoria. The health departments of these two counties obtained hospitalization for relatively few cases, as the figures in table 5 indicate. Here it is revealed that only 15 persons, or 18 percent of the total cases officially recorded in County A at the end of the year, and 52 persons, or one-fourth of the total cases on County B's roster, received sanatorium care during the study interval. On

[4] No comparison was attempted for measles cases, because of the volume encountered.

the contrary, 53 persons, over one-half of the diagnosed cases under supervision of Department C, were hospitalized within the same period of time.

The control activities of County C may be described as entirely a sanatorium-sponsored program inasmuch as ambulatory cases, symptomatic suspects, and contacts, as well as in-patients, were given tuberculin tests and X-ray and physical examinations by members of the sanatorium staff. Out-patients of the foregoing classes were usually referred to them by the attending physician.

X-ray as a diagnostic technique was more consistently employed in County C than in Counties A and B. (See table 5.) In the former area an X-ray examination was made of more than three-fourths of the 265 persons who received any type of examination (including complete tuberculin test,[6] X-ray, clinic examination, and examination by private physician), while in County A less than one-third and in County B less than one-fifth of the persons examined had the advantage of this aid to diagnosis. The variation found reflects another difference in policy. Although the clinician of County C reported that an X-ray picture was made for over half of the cases and for 90 percent of the contacts and suspects examined, clinicians of Counties A and B used this device only when physical findings made a diagnosis questionable. However, these health departments did make a concentrated effort to secure an X-ray examination for all child contacts who had positive reactions to tuberculin tests. In this policy they were strikingly successful.

TABLE 5.—*Distribution of tuberculosis clientele registered by the health departments of three selected counties according to first designation of patient during the study year and the type of service received*

Type of service	Number and percentage of cases and contacts who received specified services for tuberculosis											
	County A				County B				County C			
	Cases		Contacts or suspects		Cases		Contacts or suspects		Cases		Contacts or suspects	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All types considered [1]	83	------	428	------	215	------	1,097	------	90	------	481	------
No health department service	4	4.8	198	46.3	10	4.7	525	47.9	4	4.4	297	61.7
Nursing service	75	90.4	202	47 2	185	86.0	554	50.5	26	28.9	84	17.5
Examination of any kind	34	41.0	116	27.1	147	68.4	345	31.4	90	100.0	175	36.4
Tuberculin test	------	------	40	9.3	14	6.5	209	19.1	3	3.3	72	15.0
X-ray	7	8.4	38	8.9	13	6.0	77	7.0	46	51.1	158	32.8
Clinic	16	19.3	112	26.2	96	44.7	163	14.9	50	55.6	139	28.9
Private physician only	12	14.5	1	.2	32	14.9	5	.5	------	------	------	------
Sanatorium care	15	18.1	------	------	52	24.2	5	.5	53	58.9	10	2.1

[1] Some individuals received several types of service.

[6] A completed tuberculin test is one for which the reaction was read.

While the records of Health Department C indicated that hospitalization of the case was concentrated upon in that county, the corresponding agencies of Counties A and B appear to have subscribed to the policy of making home nursing visits to all families who were known to have been exposed to infection. The primary purpose of nursing service in County B was to promote examination of family contacts. Upon her initial call the nurse endeavored to arrange for a return visit with the health officer for the purpose of tuberculin testing all child contacts. Those having positive reactions were then given X-ray examinations at the general hospital in the county as a preliminary procedure to chest clinic admission. Frequently it was necessary for the nurse to furnish patients transportation to the clinic. Subsequent instructive visits, after the goal of contact examination was reached, included such service as advice concerning hygiene, diet, or precautionary measures; interpretation of clinic reports; and instructions concerning sanatorium admission and care. There was no fixed interval of time to determine subsequent visits, and no routine practice was followed. Generally, active cases of tuberculosis not under the supervision of a private physician were visited about once every three months.

The nurse of County A also attempted to visit all families eligible for tuberculosis service, but the fact that less than one-half of these households received more than a single visit raises doubt, from the standpoint of tuberculosis control, as to the effectiveness of her visiting program. Her attention was concentrated upon the case in the household rather than upon the contacts, the primary purpose of her visit being to instruct the patient in methods of caring for himself and in precautions designed to protect other members of the family. Some attempt was made to stimulate interest in examination of contacts, but this was usually incidental to attention to the case. Only when family members exhibited suspicious symptoms of disease did the nurse assiduously urge clinic attendance.

Inspection of the data reveals that the health departments of Counties A and B closely adhered to their policies of visiting all families known to have been exposed to tuberculosis. Nursing service was rendered to 91 percent of the 140 families appearing on the register of County A and to 88 percent of the 294 families constituting County B's tuberculosis file. The records also disclose that, in practice as in policy, the nursing staff of County A was customarily concerned only with the family member diagnosed as a case or exhibiting definite symptoms of the disease, for nursing service was recorded for 90 percent of the cases and nearly one-half of the contacts in this area. In County B, where the nurse was supposed to check upon the condition of all contacts in the home, actual practice differed

from the stated policy of the jurisdiction. Here, as in County A, relatively more attention was devoted to cases than to contacts as nursing service was recorded for 86 percent of the cases and 50 percent of the contacts known to the health department.

Nursing service held a minor position in County C's plan of tuberculosis control. In this county, only one-third of the 184 families known by the health department to have been exposed to infection were visited by a public health nurse. Persons attended embraced slightly more than one-fourth of the cases and one-sixth of the contacts. The fact that so few tuberculosis patients received nursing service in County C becomes increasingly significant when it is realized that the population load per nurse was smaller here than in either of the other areas under discussion.

OPERATION OF VENEREAL DISEASE CLINICS

Only two of the counties maintained clinics for the diagnosis and treatment of venereal disease. One of these organizations was considerably larger than the other. The clinic of County C was visited by 1,672 persons, but only 769 received treatment. Corresponding figures for County B's clinic were 167 and 108. McKneely and Pearson[6] in their study of operating principles of these two clinics found both of them to be ineffective in the following respects: (1) Lack of basic data for gaging the extent of the venereal disease problem within the localities involved, (2) limited scope of service, (3) desultory extraclinic investigation, (4) incomplete recording of significant information, (5) failure to utilize appropriate diagnostic aids, and (6) treatment which disregarded individual differences.

According to the investigators, neither health department could even estimate the prevalence or incidence of venereal diseases within its jurisdiction; therefore it was impossible to understand the problem as a whole. Emphasis was placed upon the control of syphilis, with almost no regard for the problem of gonorrhea. Little relationship existed between the maternity clinics and those set up for venereal disease. Failure to investigate the source of infection and all contacts of the patient was particularly striking. In both clinics the lapsed attendance of patients was also marked.

The clinic of County C maintained a fairly uniform method of treatment, prescribed by the State health department, which specified definite pauses in the course of treatment. The clinic of County B subscribed to no predetermined system but, in actual practice, followed the plan of giving continuous treatment rather than of permitting rest periods.

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[6] McKneely, Thomas B., and Pearson, Kay: Does this describe your venereal disease clinic? Venereal Disease Information, Vol. 18, June 1937.

MATERNITY SERVICE

According to table 6, the health department furnished maternity service, almost exclusively nursing in character, to 10 percent of the maternity population[7] in County A, 15 percent in County B, and 12 percent in County C. In all three areas, most of the maternity patients served by the health departments were in the poor or very poor economic classification.[8] Race was of minor importance in the selection of cases to receive public service in County C. The other two organizations observed different practices in this respect. Health Department B concentrated a large portion of its service on Negro patients. Health Department A, on the other hand, favored white mothers as recipients of maternity attention.

TABLE 6.—*Number of births, estimated number of maternity cases,[1] and proportion of cases served by the health department during the study year*

County	Number of births	Maternity cases: Estimated number	Maternity cases: Served by health department: Number	Maternity cases: Served by health department: Percent
A	435	761	80	10.5
B	993	1,738	270	15.5
C	902	1,578	183	11.6

[1] For the purposes of this analysis "maternity population" is defined as follows: Mothers who gave birth to live or stillborn infants during the study year, plus the proportionate number that are estimated to have become pregnant during the last 9 months of the study interval.

Not all persons listed on the health department's maternity rosters were given medical and nursing supervision throughout the maternity cycle. Some of them received antepartum service only, some, postpartum service only, and a few, delivery service only. On the other hand, certain patients received both antepartum and postpartum supervision, while others were assisted at delivery and received either antepartum or postpartum care. More patients in Counties A and C received antepartum than postpartum service. This situation was reversed in County B where one of the objectives of maternity service was the delivery of birth certificates by nurses. Always on this occasion a postpartum visit was recorded by the nurses.

Patients came to the attention of the health department through various channels. In Counties A and C patients and relatives were the most frequent sources of information (table 7). The fact that about 40 percent of the health department maternity patients in these

[7] For the purposes of this analysis "maternity population" is defined as follows: Mothers who gave birth to live or stillborn infants during the study year, plus the proportionate number that are estimated to have become pregnant during the last 9 months of the study interval.

[8] Those who have the bare necessities of life, but no luxuries, are regarded as poor, while those who lack sufficient food, shelter, and clothing are classified as very poor.

two counties sought aid themselves would seem to indicate that the department had succeeded in bringing to the attention of prospective mothers the services which a nurse might render during pregnancy. The chief source of information in County B was the birth certificate. Naturally cases found in this manner could not be given any antepartum service.

Antepartum care consisted chiefly of nursing supervision. The average number of home visits made to each patient ranged from 2.1 in County B to 3 in County C. Failure to find cases early is one factor that prevents the nurses from following the recommended practice of continuous supervision of prenatal cases. Very few patients were seen during the first trimester of their pregnancy; those found in the second and third trimesters were almost equally divided as to number. Proportionately more cases were discovered early in County A than in either other area; County B ranks least favorably from this standpoint. However, relatively more patients availed themselves of clinic service in the latter jurisdiction than in County C. No maternal hygiene clinic was maintained in County A; however, clinic facilities in adjoining jurisdictions were utilized to some extent. Although clinic service was not widely distributed in any county, those patients who attended had been urged to do so by the nurses during home visits.

TABLE 7.—*Number and percentage of maternity patients served by the health departments of three counties according to source of first information*

Source of first information	County A		County B		County C	
	Number	Percent	Number	Percent	Number	Percent
All sources	80	100.0	270	100.0	183	100.0
Patient or relative	32	40.0	19	7.0	74	40.4
Neighbor	6	7.5	19	7.0	23	12.6
Visit to another member of family	10	12.5	52	19.3	26	14.2
Social and other agencies	17	21.3	41	15.2	31	16.9
Midwife	2	2.5	16	5.9	2	1.1
Physician	4	5.0	9	3.4	3	1.6
Birth certificate			63	23.3	8	4.4
Other	9	11.2	51	18.9	16	8.8

Throughout the program there was evidence of lack of planning in the service rendered. Patients with recorded symptoms of toxemia received more visits on the average than did the nontoxic patients, but many of those with symptoms of toxemia failed to receive supervision through the months of pregnancy following the first visit. Frequently even those patients with symptoms of toxemia who were subsequently visited did not receive a return visit as early as patients free from toxic condition. Patients found early in their pregnancy received more visits than those found late, but there was no evidence that a planned program of visiting was being followed. More than half of the postpartum patients were not visited during the period that a nurse's services are most needed, namely, the lying-in period.

SANITATION ACTIVITIES

Sanitation officers and their part-time assistants (the latter provided through cooperation of the work relief agency) were almost entirely responsible for sanitation services, except that the health officers were called upon in matters where policy was involved. Milk and water sanitation and privy-building projects represented outstanding activities during the course of the study year. Inasmuch as work of the relief sanitarians cannot be converted into the equivalent of full-time performance, only services of the regular sanitation officers will be subjected to analysis in this discussion. Not only was the proportion of all homes which were inspected by the sanitation officer higher for Counties A and B than for County C, but the aggregate volume of service reported for the first two counties was also higher than for the third. However, the emergency privy-building program was much more extensive in County C than in A or B. Supervision of this work absorbed much of the sanitation officer's time. In the distribution of service all three departments favored residential premises over those which were nonresidential in character. Respectively, 1,440, 1,240, and 308 residential visits were reported during the year by the three sanitation officers.

Lack of uniformity is noted in the concentration of sanitation service rendered by the three health departments. In County C 28 percent of all homes visited were located in the open country. In Counties A and B, on the other hand, 40 and 45 percent, respectively, of all residential premises visited by the sanitation officers were classified as rural. This proportion represents particular emphasis upon rural sections in County B, as only 20 percent of all families residing in this jurisdiction are classified in the rural category. Such marked concentration of sanitation service to rural homes is due, in great measure, to the milk and dairy program which was receiving much attention from the health department during the study year. Of the 343 rural premises visited, 148 were dairy farms. Inspection of these milk-producing premises to determine whether regulations were being complied with was the sanitation officer's main objective in visiting them. Installation of approved type privies was often necessary before requirements of the milk ordinance could be met. Most of the actual building was done by relief workmen, but the sanitation officer assisted in the preliminary survey and designated the premises that should receive new privies.

In County B residential visits were divided about proportionately between white and colored families. In Counties A and C, however, white families were favored.

Perhaps one of the most striking differences in the activity of the three sanitation officers is revealed by the sources of call which stimu-

lated their premises visits. (See table 8.) In County A the sanitation officer himself initiated service to more than three-fourths of the premises which he visited. Twelve percent of the residences visited in this county were inspected at the request of the occupant of the premises. Plumbers, contractors, carpenters, and well-diggers constituted practically the only other institutors of service. The situation in County C was directly opposite to the one just described. Here the sanitation officer appears to have initiated relatively little service himself; instead, most of the visits were made on invitation.

TABLE 8.—*Distribution of premises visited for the first time by the sanitation officers of three selected counties in response to a specified source of call*

Source of call	Premises visited in response to each source of call					
	County A		County B		County C	
	Number	Percent	Number	Percent	Number	Percent
All sources	709	100.0	817	100.0	200	100.0
Sanitation officer	559	78.9	263	32.2	40	20.0
Occupant of premises	84	11.9	34	4.1	45	22.5
Neighbor	8	1.1	76	9.3	15	7.5
Plumber, contractor, or well-digger	45	6.3	3	.4	28	14.0
Emergency relief workmen			414	50.7	35	17.5
Local or county official	7	1.0	14	1.7	37	18.5
Other	6	.8	13	1.6		

One-half of the premises inspected by the sanitation officer of County B were visited with emergency relief workmen in connection with the sanitary survey of the county, to which reference has already been made. One-third of the premises were visited through interest of the sanitation officer alone. There was less evidence of sanitary improvement being initiated by premises occupants in County B than in either of the other counties. Conversely, neighbors made relatively more complaints, a condition probably resulting from greater concentration of the population there than in either of the other areas. The complaints usually arose from nuisances such as hog farms, open wells, rubbish piles or refuse heaps, dead animals, or objectionable pets or poultry.

SUMMARY

Service records of three health departments similar in population served and in general administrative organization reveal a striking lack of uniformity in their methods of handling specific health problems. Diversity of policy is demonstrated by the manner in which the several health units operated for the control of communicable disease, tuberculosis, and the venereal diseases, and for the provision of maternal hygiene and sanitation services. Whereas one department favored supervision of only such serious transmissible illnesses as diphtheria and scarlet or typhoid fever, another made no selection as

to type but attempted to visit all communicable disease cases brought to the department's attention. In one county the restriction of cases and contacts was emphasized; in another, little effort was made to quarantine cases of even the graver kinds of illness. Repeat visits characterized the policy of one department; in contrast, another was likely to make but a single visit.

The three organizations showed marked variation in the number of tuberculosis patients brought within the scope of health department activity. They also differed as to the type of service stressed. Hospitalization was the primary approach of one department; the second relied upon repeated clinic examinations; the third, in addition to clinic service, emphasized field visits.

Only two of the health departments maintained clinics for the diagnosis and treatment of venereal disease. Approximately ten times as many persons visited one of these clinics as were served by the other. A method of treatment prescribed by the State health department was followed by one venereal disease unit, but the other subscribed to no predetermined system. Rest periods were recommended by one, continuous treatment by the other.

That no common program of maternal hygiene has been adopted is evident from the following circumstances: Uniformity was lacking in the selection of patients according to race. Maternal hygiene clinics were maintained by only two of the three counties. Antepartum care was stressed in two counties, postpartum visits in the third. Finally, variation existed among the departments from the standpoint of discovering patients early in their pregnancy.

Although some planning was evident in all three sanitation programs, comparable features were not covered. In two counties, services to residential premises were frequently initiated by the sanitation officers; in the third it was the custom to make inspections only when a request came for the sanitation officer to call. Furthermore, different bases were used in the three areas for selecting premises to receive sanitation measures. One department concentrated upon service to homes located in towns and villages, while the other emphasized improvement of sanitary conditions in rural homes. White families were favored in two counties, but race of the occupant had no influence upon the premises inspected in the third.

DISCUSSION

Examples of more extremely varied methods of handling the same type of health problems could scarcely be found than those portrayed as existing in these three counties. When it is recalled that the counties were quite similar in type of population, in organization of the health department responsible for each program, and in most other respects, the wide differences in procedures become even more

significant. They indicate either conspicuous disagreement among the three health officers as to the most effective methods of rendering public health services, or a failure to ascertain the most effective procedures and put them into practice.

If such differences are typical of other county health departments, and it is believed that they are, they definitely suggest the need for a critical evaluation of the activities of county health department personnel in order that ineffective effort may be diverted into productive action. Certainly the extremely different procedures followed by these three counties could not have been equally effective; in fact, the most effective procedures may not have been used in any of the counties. In view of this, it is urgent that public health workers give more consideration to the success of their efforts so that every dollar spent for public health may purchase maximum health for the community.

BACTERICIDAL EFFECT OF THE PARAFFINING OF PAPERBOARD USED FOR PAPER MILK CONTAINERS [1]

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INTRODUCTION

The paper container for fluid milk is not of as recent origin as is generally believed. Winslow (*1*) mentioned a study of the paper bottle by Dr. A. H. Stewart which was reported in Sanitation for December 6, 1905, and stated that the latest departure in the way of a milk bottle was the single-service paper milk bottle sold by the Renno Case Company of Philadelphia. In the annual report of the United States Public Health and Marine Hospital Service for 1908, reference is made to an opinion by the Chief, Division of Chemistry, Hygienic Laboratory, relative to paraffined milk containers. This opinion was given in response to an inquiry from the Liquid Paper Package Company, Washington, D. C. In 1908, one of the Canadian farm journals (*2*) contained a discussion of the advantages and disadvantages of paper milk bottles. In 1909, Winslow (*3*) reported a single-service milk container of woodpaper made and invented by G. W. Maxwell of San Francisco and in use at that time by dairymen in Los Angeles.

Despite its early introduction, however, the paper milk container did not come into extensive commercial use until about 1929–30. Introduced at that time in New York City, it is now being used in a number of the larger as well as in many smaller cities in this country. In most cases the use of the paper container has been confined to the wholesale distribution of milk, that is, for milk to be sold through

[1] From Milk Investigations, Division of Public Health Methods, National Institute of Health.

stores and restaurants. Recently, however, two of the larger milk companies in New York City have started the use of 2-quart paper milk containers for retail delivery (*4*).

PARAFFINING OF PAPER MILK CONTAINERS

The various single-service containers used for fluid milk were classified by Tracy (*5*) into three general types, namely, "those prefabricated and requiring a special filling machine; those prefabricated but not requiring a special machine for filling, it being possible to use the regular glass bottle filling machine; and finally, those that are formed and paraffined in the dairy just before filling, requiring, of course, a special machine for the purpose." Irrespective of the type, however, practically all of the single-service paper containers are paraffined after being formed.

Tanner (*6*) gave the following purposes for the paraffin coating of paper milk containers:

1. Contributes greatly to strength and rigidity.
2. Helps to secure a hermetical seal.
3. Improves the appearance of the bottle by causing a more brilliant finish.
4. Inert to attack by ordinary bacteria.
5. Free from color, taste, and odor.
6. Available with various melting points.
7. Practically free from microorganisms.
8. Good waterproofing surface.
9. Prevents microorganisms from entering the milk.
10. Contributes to a sterile container.

Methods used for the bactericidal treatment of glass milk bottles are not generally applicable to the bactericidal treatment of paper milk containers. Since practically all paper milk containers are paraffined, the present study was made to obtain data useful in determining temperature and time combinations of paraffining that would provide adequate bactericidal treatment of the surfaces of these containers.

For the paraffining of paper containers in this country, the temperature of the paraffin is usually in the range of 160°–180° F. With these high paraffin temperatures, it would seem reasonable to expect that the exposure time need be of only brief duration to insure a sterile container. Some investigations, however, have indicated that the necessary exposure time is probably not as brief as had been anticipated.

Tanner (*6*) reported an investigation in which strips of paperboard inoculated with *Esch. coli* were subjected, after drying, to heating in

both water and paraffin. None of the strips which were heated in water at a temperature of 168° F. carried living cells. Those heated in paraffin at 168° F. and 190° F. for 12, 15, 17, 20, and 25 seconds showed almost uniform presence of viable cells of *Esch. coli.*

Prucha (*7*) studied the bactericidal effect of paraffining of paperboard both in the milk plant and in the laboratory. In the laboratory study, he used strips of paperboard which had been dipped in a suspension of *B. prodigiosus*. After drying, they were paraffined at different temperatures for varying lengths of time. A table giving the results of a typical run showed that of the six strips of paperboard examined at each temperature and time combination studied, the bacteria were all killed in 20 seconds at 212° F.; in 30 seconds at 200°, 190°, and 180° F.; in 45 seconds at 170° F.; but were not killed in 1 minute at 160° F. Prucha concluded that when the containers were protected in the manner he suggested, paraffining the containers at 185° F. for 30 seconds would result in a practically sterile container, but that entire dependence on paraffining to insure complete sterility of the container might not be sufficient.

Investigations (*8, 9, 10*) have shown that microorganisms suspended in water-free substances such as fat, paraffin, oil, and glycerin are not readily killed by the sterilizing action of heat. In fact, in the absence of water, the sterilizing action obtained by heating in glycerin or oil was found to correspond to that of dry air (*9, 10*).

ESCH. COLI AS A TEST ORGANISM

In experiments on the bactericidal effect of paraffining of paperboard, *Esch. coli* has sometimes been used as a test organism and the work has been directed toward obtaining the temperature and time combinations required to produce sterility. Cultures of *Esch. coli*, however, vary in their thermal resistance (*11*). If the culture of *Esch. coli* used is more or is less heat-resistant than the most heat-resistant pathogen transmissible through milk supplies, then the temperature and time combinations required to produce sterility will be more or less stringent, respectively, than are necessary.

In the present study of the bactericidal effect of paraffining of paperboard, a strain of *Esch. coli* was used as the test organism. From the thermal resistance curve of this test organism, the percentage reduction was determined at 140° F. for 20 minutes, the temperature and time combination taken as lethal for the most heat-resistant pathogens transmissible through milk supplies (*12*). The thermal resistance of this strain of *Esch. coli* was such that a 24-hour skim milk culture in sterile skim milk showed a 99 percent reduction (initial count 1,000,000 colonies per cc.) at 140° F. for 20 minutes. Efforts in this study were therefore directed to determining the tem-

perature and time combinations of paraffining which would give a 99 percent reduction of this test organism on the 2-inch squares of paperboard that were tested. This criterion is based on the assumption that the same relation that exists in milk at 140° F. between the thermal resistance of the test organism and the most heat-resistant pathogen transmissible through milk supplies also holds true at higher temperatures in paraffin. However, a similar assumption is made whenever *any* test organism is used, even though the criterion is the complete killing of the test organism rather than a definite percentage reduction.

EFFECT OF MOISTURE

As paraffin is an anhydrous substance, any factors which affect the moisture content of the paperboard and especially the surface moisture at the time of paraffining would influence the bacterial reductions due to the paraffin treatment. In a test procedure, these factors would be the original moisture content of the paperboard and of the bacterial culture used, together with the drying that occurred between application of the bacterial culture and subsequent paraffining of the paperboard.

Paperboard stored under varying conditions of temperature and relative humidity will naturally vary in moisture content. The paperboard used in this work was therefore stored in a cabinet having a relative humidity of 40 to 50 percent at a temperature of about 70° F. These conditions were assumed to represent a fair average of the conditions under which paperboard would be stored in practice.

Moreover, when paperboard for test purposes is inoculated and then dried before being paraffined, the amount of drying which occurs in a given time is affected by the humidity conditions under which the drying takes place. Throughout this study the 2-inch test squares of sterilized paperboard, after immersion in the culture of the *Esch. coli* test organism, were dried in a cabinet containing a dehydrating agent so as to facilitate drying under approximately uniform conditions. The period of drying, usually about 45 minutes was regulated so as to bring the weights of the inoculated paperboard back to about their original weights in storage, making allowance for increases in weight due to the milk solids in the culture. An increase of about 1 percent in the weight of the paperboard was calculated as due to the milk solids in the culture. Weights of the individual pieces of paperboard were accurately determined at various steps in the test procedure. Regulation of the drying time was based on the total moisture content of the paperboard, as it was not considered practicable to differentiate between moisture within the paperboard and that on the surface. The initial bacterial plate count of the *Esch. coli* test organism, which averaged about 1,000,000 per 2-inch test square of

paperboard, was reduced about 85 percent during the drying period. The plate count of the paperboard after drying was used in computing the percentages reduction of the test organism due to paraffining.

Because of the inability of most of the test organisms used in experimental studies to survive for a long time on paperboard, the possible desirability of holding paperboard in storage before it is paraffined has been suggested (*6*). Increasing the time interval between occurrence of contamination of paperboard and time of paraffining would tend to reduce the contamination, but it is not

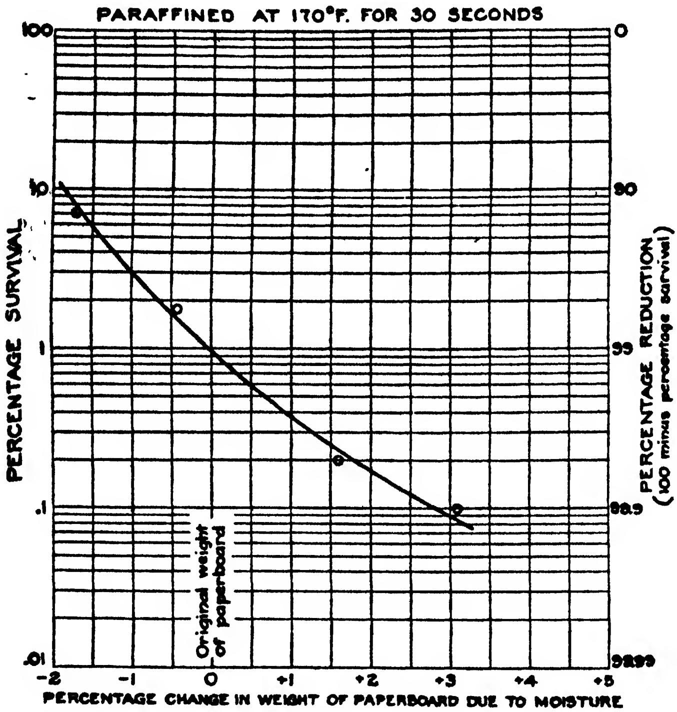

FIGURE 1.—Percentage reduction of *Esch. coli* test organism due to paraffining, as affected by moisture remaining after paperboard was dried for various periods following inoculation.

impossible for contamination to occur between withdrawal of the paper from storage and its subsequent paraffining.

A series of tests was made to determine the approximate time in the drying cabinet that would give the requisite drying of the pieces of inoculated paperboard. Drying times of 15, 30, 45, and 60 minutes were used, and all of the pieces of paperboard were paraffined at 170° F. for 30 seconds. Data regarding these tests are given in table 1, and figure 1 shows how the percentage reduction of the *Esch. coli* test organism due to paraffining was affected by the moisture that remained after the paperboard was dried for various periods following its inoculation.

TABLE 1.—*Data on inoculation and drying of paperboard and its effect on percentage reduction of Esch. coli test organism due to paraffining at 170° F. for 30 seconds*

Minutes detenton in drying cabinet	Pieces of paper-board tested	Before paraffining				After paraffining	
		Mean count of test organism on 2-inch test squares of paperboard after:		Percentage reduction of test organism due to drying	Percentage change in original weight of paperboard due to moisture remaining after inoculation and drying	Mean count of test organism on 2-inch test squares of paper-board	Percentage reduction due to paraffining
		Draining for 5 minutes	Detention in drying cabinet				
15	4	700,000	360,000	49	+3.1	350	99.9
30	8	700,000	280,000	59	+1.6	550	99.8
45	8	700,000	110,600	84	−.45	2,000	98.2
60	5	700,000	35,000	95	−1.70	2,500	92.9

EXPERIMENTAL PROCEDURE

The paraffining equipment used in this study is illustrated in figure 2. A beaker containing the paraffin was suspended in an electrically controlled constant-temperature water bath. The paraffin was continuously agitated and was kept covered at all times except for the brief periods when the pieces of paperboard were immersed in it. Paraffins having melting points of 128–130° F. and 133–135° F. A.M.P. were used. These are the two grades of paraffin said to be most frequently used by milk-container manufacturers. The grade with the lower melting point is generally used in winter as its cost is less than that with the higher melting point. Espach (*13*) stated that the main commercial property of paraffin wax was its melting point; the higher the melting point the more valuable the wax. He gave the range in the melting point of the bulk of the commercial paraffin waxes as from 118° to 136° F., but also mentioned that waxes with melting points as low as 108° F. and as high as 160° F. found commercial uses.

The paperboard used for this work was of a type used commercially in the manufacture of paper milk containers. The surface of this paperboard was quite impervious, so probably the only penetration of the contaminating culture was that which may have occurred along the cut edges of the paperboard. If the porosity of paperboard used is such that contamination can get within the paper, this contamination no doubt would be protected to some extent against the bactericidal effect of the paraffining process.

A detailed description of the laboratory test procedure using the 2-inch test squares of paperboard is as follows:

(*a*) A number of 2-inch test squares of paperboard, from the storage cabinet previously mentioned, were sterilized in the autoclave.

(*b*) After sterilization, the paperboards were returned to the storage cabinet for about 24 hours to give them an opportunity to return to approximately their original weights prior to sterilization.

(*c*) The sterile paperboards were inoculated by immersion in a skim milk suspension of the *Esch. coli* test organism (24-hour skim milk culture diluted with sterile skim milk to a plate count of about 15,000,000 per cc.), and were then drained for 5 minutes to permit run-off of excess culture.

(*d*) After draining, one of the paperboards was disintegrated in 500 cc. of sterile water and samples were plated [2] to determine the total number of organisms on the board prior to drying.

(*e*) The other paperboards after draining were placed in a drying cabinet for the length of time (usually about 45 minutes) necessary to bring their weights back to approximately the original weights in storage prior to sterilizing, making allowance for increase in weights due to the milk solids in the culture suspension.

(*f*) One or two of these paperboards were each disintegrated in 500 cc. of sterile water and samples were plated to determine the total number of organisms on the boards after drying. (This bacterial plate count was used as the initial count in determining the percentages reduction of the test organism due to paraffining.)

(*g*) The remaining paperboards, after immersion in the suspension of the test organism, followed by draining and drying as previously described, were immersed in paraffin of different temperatures for various periods of time.

(*h*) After paraffining, the paperboards were allowed to cool for 5 minutes.

(*i*) The paperboards were then each disintegrated in 500 cc. of sterile water and samples were plated to determine the percentages reduction of the test organism effected by paraffining. (Ten 1 cc. samples were plated of each disintegrated piece of paraffined board.)

RESULTS AND DISCUSSION

Figure 3 shows the mean percentages reduction of the *Esch. coli* test organism for various immersion times at paraffin temperatures of 160°, 165°, 170°, 175°, and 180° F. Each of the points on the curves represents the mean reduction of 15 to 25 separate test pieces of paperboard. For each of the paraffin temperatures studied, the rate of reduction was quite rapid at the start, and then slowed down as the immersion time increased. This slowing down in the killing rate as the length of immersion time increased may have been due in

[2] Standard nutrient agar was used for all plating work and plates were incubated at 37° C. for 48 hours. The use of standard agar rather than a differential media was possible because pure cultures of *Esch. coli* were used throughout the study. Random checks were routinely made on differential media of organisms remaining after paraffining.

Disintegration was carried out in a high speed mixer which accomplished complete disintegration of even the pieces of paraffined paperboard within 2 to 3 minutes.

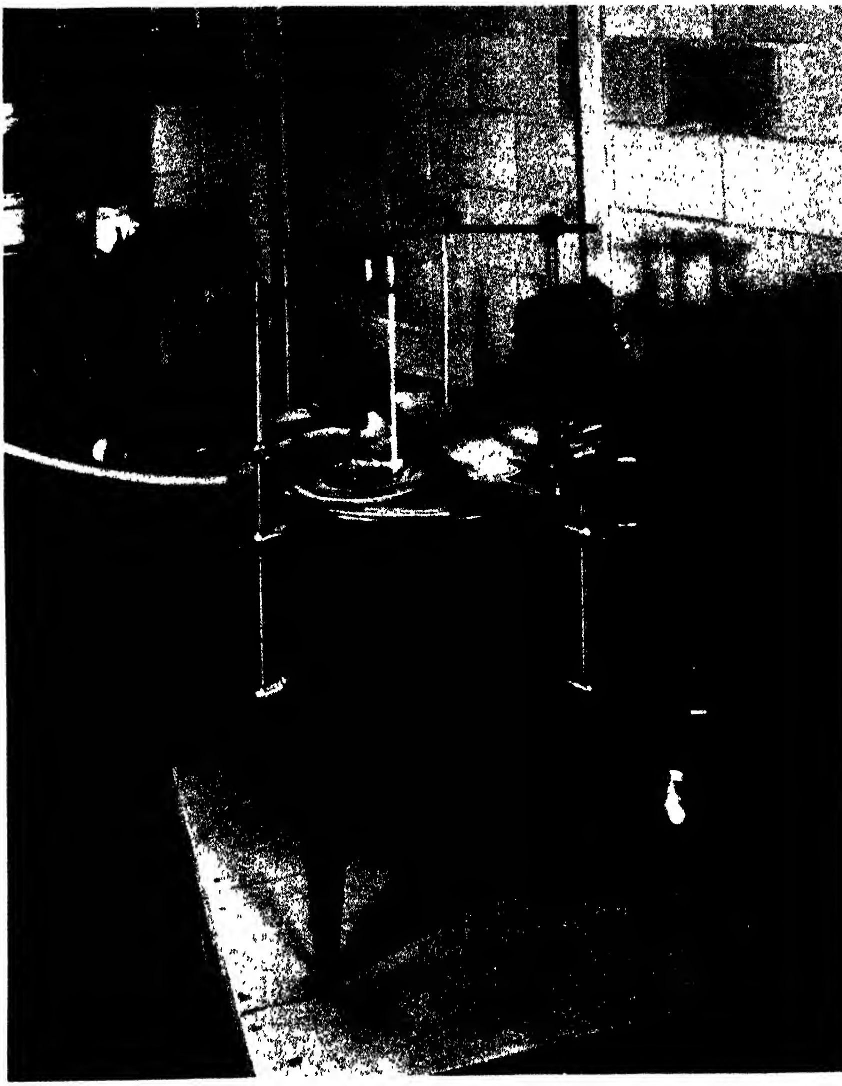

FIGURE 2.—Paraffining equipment.

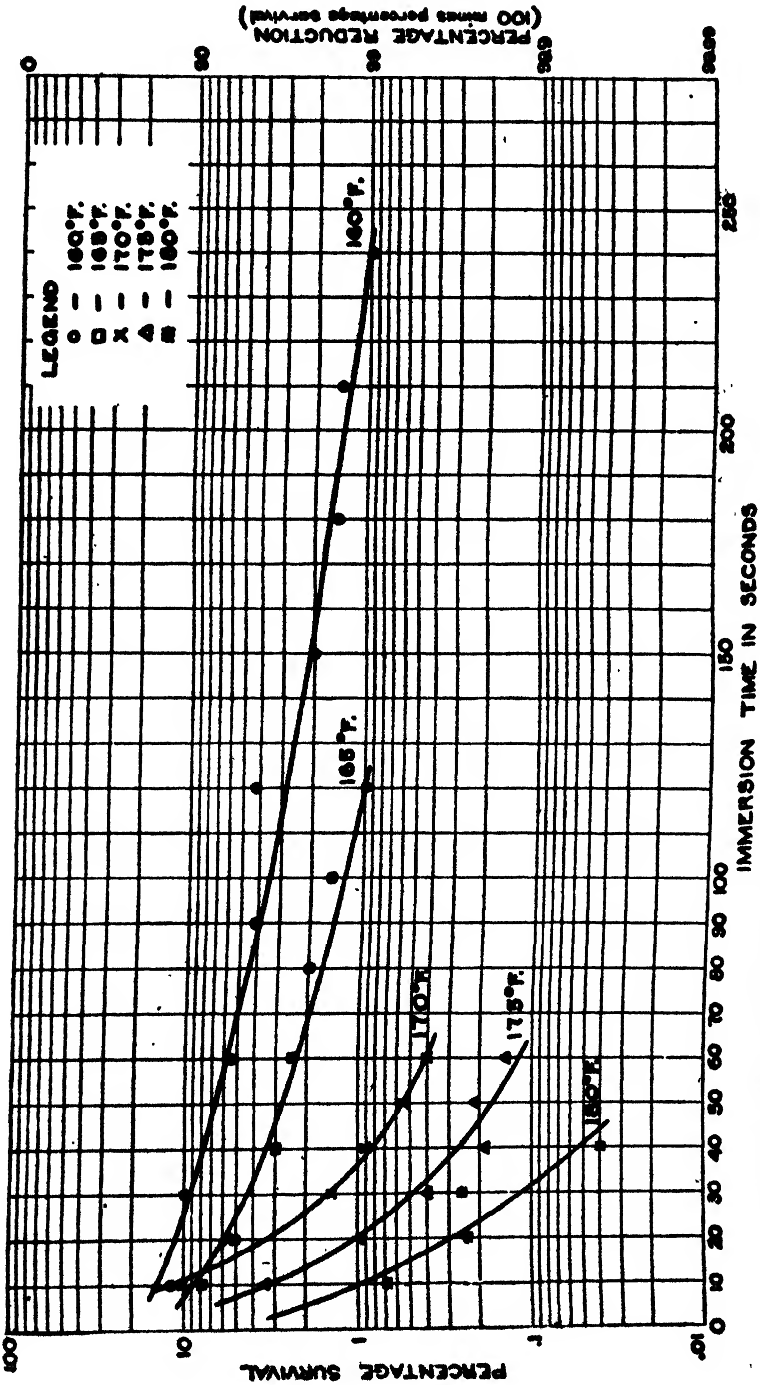

FIGURE 3.—Mean percentages reduction of *Esch. coli* test organism for various temperature and time combinations of paraffining.

part to decreasing moisture on the surface of the paperboard. It will be noted that a mean 99 percent reduction of the *Esch. coli* test organism due to paraffining (criterion reduction used) was obtained in about 10 seconds at 180° F., 20 seconds at 175° F., 35 seconds at 170° F., 2 minutes at 165° F., and 4 minutes at 160° F. The relation between immersion time and paraffin temperature for 99 percent reduction of the test organism is given in figure 4.

It has been observed by some investigators that a paraffin temperature of 180°–185° F. does not appear to be much more bactericidal, if any, than a temperature of 160° F., and that increasing the exposure

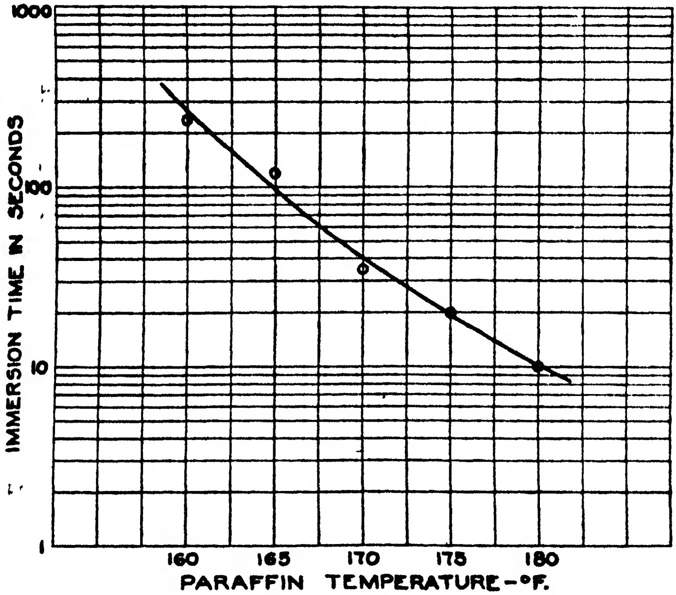

FIGURE 4.—Relation between paraffin temperature and immersion time for 99 percent reduction of *Esch. coli* test organism.

time at a given paraffin temperature does not appreciably improve the results obtained. In figure 5 there is shown the distribution of the percentages reduction of the *Esch. coli* test organism for the individual test pieces of paperboard immersed for various times in paraffin of 170° F., as well as the mean reductions for these temperature and time combinations of paraffining. This chart indicates that there was considerable variation in the bacterial reductions within each of the immersion times studied. A similar condition was found at the other paraffin temperatures studied. It was also found that at the same immersion time there was a considerable range in the paraffin temperature that produced the same percentage reduction for individual pieces of paperboard. It can therefore be stated that the range of the percentages reduction of the test organism on the indi-

vidual pieces of paperboard for the various immersion times at the same temperature, or for different temperatures at the same immersion time, overlapped each other. In a few cases, individual bacterial reductions differing considerably from the majority obtained at the same temperature and time combination were sufficient in number or magnitude to affect appreciably the mean results obtained. However, as is evident in figure 3, the mean results for the various temperature and time combinations of paraffining showed a definite trend of increased percentage reduction of the *Esch. coli* test organism

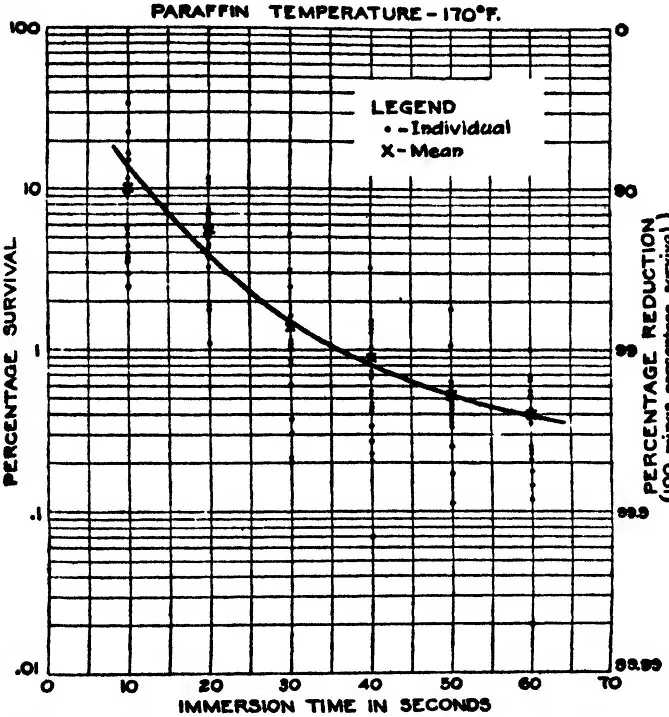

FIGURE 5.—Individual and mean percentages reduction of *Esch. coli* test organism.

with increased temperature at a given immersion time and with increased immersion time at a given temperature. When experiments on the bactericidal effect of paraffining have been directed toward determining temperature and time combinations required to produce total killing of a test organism, the variations in results for individual tests have probably covered a still wider range than was the case in this study. This additional variation would be due to the skip results occasioned by the chance survival of a few organisms for abnormally long periods and to the chances involved in sampling when very few organisms are present. If, instead of working with pure cultures, the paperboard tested has a mixed bacterial flora, wide

variations in bacterial reduction due to paraffining again may be obtained. With a mixed bacterial flora it is quite possible that, although the majority of the organisms are readily killed, a few resistant ones remain and a temperature higher than either 160° or 185° F. at the immersion times used is necessary to kill these few organisms.

Prucha (*7*) made the following statement in connection with some of his studies: "In these tests in which inoculated containers were paraffined, and a large number of these were paraffined in each test, invariably one or two containers would be positive, and that was irrespective of the temperature used. Whether the bacteria survived the paraffining or whether in handling such rich suspension an occasional accidental contamination took place, it is difficult to conclude. The heavier the inoculation, the more positive cases appeared." Prucha's results, however, as shown for a typical laboratory run, in which he paraffined strips of paperboard inoculated with *B. prodigiosus*, indicated the same general trend as the results of this study shown in figure 3.

Tanner (*6*) suggested that although a greater destruction of bacteria may be obtained at 185° F. than at 160° F., it is more than offset by the lighter coat of paraffin which is applied, and that since the function of the paraffin is to waterproof the container and give a surface which is impervious to bacteria, a heavier coat may be desirable. The viscosity of paraffin drops only slightly as its temperature is increased (*14*), so if a thinner coating of paraffin is obtained at the higher paraffin temperatures it is probably due, at least in part, to the length of the draining and cooling periods. A decrease in the time of draining and cooling might therefore be of value in improving the waterproofing qualities of containers paraffined at the higher temperatures.

Sanborn (*15*) made the following comments in discussing the effectiveness of paraffining as regards the moisture-proofing of paper containers: "Generally speaking, more satisfactory coatings of wax were obtained at 165° to 170° F. than at temperatures of 180° to 185° F. Other factors, such as the physical properties of the sheet (porosity, smoothness of surface, formation, etc.), method of paraffining and draining, temperature of container before and after paraffining, and characteristics of paraffin used, also affect moisture-proofing efficiency. With the use of higher paraffining temperatures and slow cooling, while better penetration is usually secured than at lower temperatures, there is a tendency for excessive run-off of paraffin from side seams and from parts of containers having extra thickness of paperboard, leaving exposed uncoated areas which are capable of absorbing milk and other liquids."

Stoltz and Armstrong (*16*) in a comparison of the imperviousness of commonly used paper milk containers made the following statement:

"These tests suggest that while a dipping at the higher temperatures may result in a more complete impregnation of the fiber, the drain off before cooling is excessive and leaves the fiber unprotected. A second dipping at low temperature (160° F.) will apparently result in a fairly complete protection to these containers provided the container is of such construction that the coating is not subject to excessive strain in handling."

The results of the present study indicate the greater mean bactericidal efficiency of the higher paraffin temperatures used. If the paraffining process is to serve as the bactericidal treatment for the surfaces of the paper container, the use of the higher temperatures studied appears essential, unless the immersion times generally used are considerably increased. If the use of the higher paraffin temperatures results in a paraffin coating that is too thin or otherwise unsatisfactory for practical use, it may be necessary to subject the containers to separate bactericidal and waterproofing treatments. The bactericidal treatment might be accomplished either by a paraffin bath at the higher temperatures or by some other method, followed by a paraffin bath of lower temperature to furnish the waterproofing. It is suggested that by passing the paperboard through hot air of high humidity it might be possible to render the surfaces of the paperboard sufficiently moist to facilitate bacterial reduction by paraffining without interfering with the other functions of paraffining.

SUMMARY

The paraffining of paper milk containers is discussed and results are given of other studies which have been made on the bactericidal effect of paraffining. In some studies, *Esch. coli* has been used as a test organism and the work has been directed toward obtaining the temperature and time combinations of paraffining required to produce sterility. *Esch. coli* was also used as a test organism in the present study. The thermal resistance of the strain of *Esch. coli* used in this study was such that a skim milk culture in sterile skim milk showed a 99 percent reduction at 140° F. for 20 minutes, the temperature and time combination taken as lethal for the most heat-resistant pathogens transmissible through milk supplies. The work was therefore directed toward determining the temperature and time combinations of paraffining required to produce a 99 percent reduction of the strain of *Esch. coli* that was used. Since paraffin is an anhydrous material, the moisture content of the paperboard at the time of paraffining is a factor in the bacterial reductions obtained. Moisture conditions with respect to the paperboard were therefore controlled throughout the experiment. Under the test procedure followed in this study, a mean 99 percent reduction of the *Esch. coli* test organism due to paraffining was obtained in about 10 seconds at 180° F., 20 seconds at 175° F.,

35 seconds at 170° F., 2 minutes at 165° F., and 4 minutes at 160° F. These results indicate the greater mean bactericidal efficiency of the higher paraffin temperatures used. If the paraffining process is to serve as the bactericidal treatment for the surfaces of the paper container, the use of the higher temperatures studied appears essential, unless the immersion times generally used are considerably increased. If the use of the higher paraffin temperatures is impracticable, it may be necessary to subject the containers to separate bactericidal and waterproofing treatments or provide means for increasing the bactericidal effect of paraffining.

ACKNOWLEDGMENTS

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THE DICK REACTION AND SCARLET FEVER MORBIDITY FOLLOWING INJECTIONS OF A PURIFIED AND TANNIC ACID PRECIPITATED ERYTHROGENIC TOXIN

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In an earlier report (*1*) one of us presented a method of producing a highly potent scarlet fever erythrogenic toxin followed by purification and precipitation of the toxin. At the time it was evident that the alcohol method used for the purification was not entirely satisfactory. Further experimentation developed a more suitable culture medium and a more satisfactory method of purifying the toxin (*2*). Preliminary trial indicated that children tolerated larger doses of the precipitated toxin than of the soluble toxin. Based on the experience with alum-precipitated diphtheria toxoid it was reasoned that the stimulating effect of the insoluble streptococcus toxin would also be considerably higher. Trials in a sample group of children indicated that this was the case. Therefore it has seemed worth while to observe the effect on the Dick reaction in a much larger group and to prolong the observation over a period of years in order to measure the effect on the incidence of scarlet fever. The following presentation is a report of such a study which covers a period of 4 years and approximately 65 percent of the grammar school children in both rural and urban schools in two large counties.

PLAN OF STUDY

Type of antigen used.—During the first year of the study an alcohol purified and tannic acid precipitated toxin (*1*) was used and thereafter an ammonium sulfate purified and tannic acid precipitated toxin (*2*). The antigenic value of the two preparations in the dilutions used was the same irrespective of the potency of the parent toxins. By using suitable ingredients in the culture medium and maintaining at all times optimum conditions for growth (*2*) it is possible to obtain a highly potent toxin in a medium which lends itself to a high degree of purification by one precipitation with ammonium sulfate. For example, lot No. HL–50 contains 4.337 mg. of total nitrogen and approximately 500,000 S. T. D. of toxin per cc. in the crude state. One precipitation with ammonium sulfate (65 percent saturation) reduced the total nitrogen content to 0.728 mg. without appreciably affecting the toxin content. Resolution of the toxin and precipitation with tannic acid further reduced the total nitrogen to 0.574 mg. With this particular lot of purified and tannic acid precipitated toxin the three immunizing doses contain 0.00086, 0.00344, and 0.0115 mg., respectively. This is considerably less total nitrogen per dose than

would have been possible if unpurified toxin from a meat broth culture medium had been used.

Method of selecting the children.—During the first year consent slips were sent home with each child in the first six grades in one county, and with all children in the first eight grades in the second county. That the response was good is indicated in table 1. Naturally, the response varied with the schools, but of the actual slips sent home approximately 65 percent were returned signed, leaving 35 percent of the children as a control group. The children were then given the Dick test and those found positive were given the immunizing doses. In the succeeding years all children entering the first grade who returned signed consent slips received the immunizing injections without preliminary Dick test. It is interesting to note from table 9 that only 1,970 person-years or 4.56 percent out of the 43,158 observed were lost because of failure to complete the prescribed number of doses, a percentage which is not significantly different from the normal school absenteeism.

Method of injecting the antigen.—Following a few preliminary trials with intramuscular, subcutaneous, and intracutaneous injections, the latter was selected as the most suitable method. The selection of the intracutaneous route of injection was based partly on the ease and speed of administration and on the absence of local soreness when moving the arm. The more favorable attitude of the child to a short needle and a "skin test" as contrasted to a much longer needle and the more elaborate preparation for a deeper injection also was an influencing factor. Finally, consideration was given to the belief that such injections would allow for greater antigenic stimulation owing to slower absorption. Because of the high potency of the parent toxins obtained by the method of production used, each immunizing dose could be contained in a volume of 0.1 cc. During the period of this study 19,400 such intradermal injections of 0.1 cc. were made without the development of a single local abscess or any sloughing at the site of injection.

The number of immunizing injections and their antigenic titer.—The hope in this respect was to limit the number of injections required to a number which would be practicable administratively as well as acceptable to the child and parent. It was felt that to meet these requirements three injections per child would be the upper limit. At the same time the amount of antigen contained in each injection must not cause significant reactions and yet the total amount injected must be sufficient to cause a fairly high percentage of Dick positive individuals to become negative and to cause this status to be retained for a considerable period of time. Finally, those treated must show a degree of immunity to injection following exposure at least equal to that possessed by those who have acquired a negative

Dick reaction by other means. These requirements have led to the adoption of three injections (750, 3,000, and 10,000 S. T. D. with a 2-week interval) for children of grammar school age or younger. Routine immunization of older persons against scarlet fever is not considered advisable or necessary except in certain occupations as, for example, student nurses. Since adults are more apt to respond unfavorably to protein-containing antigens, the immunizing injections for adults have been set at four in number and containing 500, 2,000, 6,000, and 10,000 S. T. D., respectively, with a 2-week interval.

Reaction to the immunizing injections.—Since the immunizing antigen used is still a raw toxin, though in the insoluble form, specific toxic reactions will follow the injection of too large a dose. The actual amount tolerated is definitely an individual matter and cannot be predetermined from the child's history or the size of the Dick reaction. With slightly excessive doses, vomiting is the most disagreeable symptom encountered. The following tabulation shows the frequency of this occurrence with doses of varying sizes.

	S. T. D.	Number of children	Percent vomiting
First dose	2,000	309	7.5
	1,500	120	6 7
	1,000	195	.5
	750	1,000+	(1)
Second dose	7,000	18	5 5
	5,000	139	20 1
	5,000	164	14.0
	3,000	1,000+	(1)
Third dose	12,000	319	6.6
	10,000	1,000+	(1)

1 Rarely.

Out of 3,797 first grade children receiving the immunizing doses without a preliminary Dick test during the last 3 years of the study 3,403, or 89.6 percent, were present for all three injections, an attendance record which probably is within the normal expectancy. Normal absenteeism accounts for the 394 who failed to receive all three injections, since no child or parent refused to complete the full course. In another group of 1,203, comprising the first six grades, 0.41 percent refused to complete the three injections whereas 8.8 percent were absent for reasons unrelated to the immunizations. A check of the attendance records in an adequate sample of the first grade rooms failed to show any abnormal absenteeism on the days immediately following the injections. From the foregoing information it would appear that the amount of toxin in the three injections adopted for this study is sufficient to produce significant constitutional symptoms only in an occasional child.

Reaction at the site of injection occurs in practically every individual but in widely varying degree. Induration is always present

and tenderness on palpation is usually present in some degree, whereas pain on motion is usually absent. Redness of varying degree is usually present and if itching is present it varies with the extent of redness. Localized heat is present in those showing the larger areas of redness and induration. A vesicle the size of a pinhead containing clear serous fluid frequently forms at the site of the needle insertion in those with the more intense local reactions.

All of the injections were made without prior questioning with regard to the presence of allergy. Four children were observed who gave reactions of an allergic character following the first or second injections. The reactions were mild and did not require specific treatment.

DICK REACTION IN THE STUDY GROUP

The two counties were selected for study for two reasons: (*a*) Because there had previously been no active immunization against scarlet fever nor had there been any Dick test studies made, and (*b*) because of the relatively high incidence of scarlet fever. Therefore, the figures which are to be presented represent the susceptibility reactions in a virgin population in a section where scarlet fever has been a disease of rather frequent occurrence.

The test toxin used.—Throughout this study freshly diluted test toxin for the Dick test was prepared by properly diluting the National Institute of Health standard toxin. This toxin contains 30,000 S. T. D. per cc. and is made with the Dochez NY-5 strain. A sample representing one of the used vials from each field trip was brought back to the laboratory and checked for potency against a fresh standard. The test injections were made into the skin of the upper inner quarter of the forearm. Readings were made only once and this 18 to 24 hours following the injections. A reaction 10 x 10 mm. in area or its equivalent, or larger, was considered positive irrespective of the intensity or amount of accompanying edema. (The accumulated data suggest that a more rigid interpretation might be better.)

Percent of the population tested.—The method of securing the children for study has already been mentioned. Column 1 of table 1 gives the number of persons available for the Dick test in each age period and column 3 gives the number and column 2 the actual percentage of the total who were given the Dick test. It will be seen that for the grammer school ages the sample represents an adequate portion of the children present.

The Dick reaction in the study group.—Columns 4 and 5 of table 1 give the age distribution of the Dick positive children, a distribution which can be regarded as typical for this test in any representative community.

TABLE 1.—*The Dick reaction in children of certain age groups in Allegany and Garrett Counties, Md.*

Age	Combined population of the 2 counties	Percent of population given the Dick test	Number given the Dick test	Results of Dick test	
				Number positive	Percent positive
Under 5	7,818	0.7	52	32	61.5
5	1,726	4.3	74	46	62.2
6	2,208	56.7	1,252	702	56.1
7	2,152	63.7	1,370	689	50.3
8	2,207	66.9	1,477	654	44.3
9	2,321	70.0	1,625	663	40.8
10	2,299	71 4	1,642	601	36.6
11	2,349	64.0	1,503	555	36.9
12	2,421	41.5	1,004	329	32.8
13	2,269	25.3	574	192	33.4
14	2,338	12.3	288	83	28 8
15	2,335	7.9	184	59	32.4
16	2,282	3 5	81	26	32.1
17	2,018	2.6	52	23	44.2
18	1,942	.6	12	5	41.7
19	1,679		2	1	
20 and over	65,121				
Total	105,485		11,192	4,660	

TABLE 2.—*Relationship between the Dick positive status of school children and the reported scarlet fever morbidity rate, also the expected morbidity rate based on the experience of the 7-year-old group*

Age	Percentage of population Dick positive [1]	Average annual morbidity rate per 1,000 [2]	Expected morbidity based on experience of 7-year-old group	Age	Percentage of population Dick positive [1]	Average annual morbidity rate per 1,000 [2]	Expected morbidity based on experience of 7-year-old group
5	62 2	16 0	20 0	11	36 9	7.8	11 9
6	56 1	15 0	18 1	12	32 8	7 3	10 6
7	50.3	16 2	16.2	13	33.4	3.8	10 8
8	44 3	15 2	14.3	14	28 8	4 4	9.3
9	40 8	11 5	13 1	15	32.4	2 3	10 4
10	36 6	11.7	11 8	16	32.1	2 5	10.4

[1] Dick reaction percentages based on tests on 10,993 children who previously had received no injections of immunizing antigen.
[2] The scarlet fever morbidity is based on 6 years of experience in 1 county and 3 years in the other, giving a total of 128,925 person-years.

Attacks of scarlet fever occur almost exclusively in persons having a positive Dick reaction. The data made available by the present study permit an evaluation of the significance of a positive skin reaction in relation to age. The Dick positive distribution for the school ages is presented in column 1 of table 2, whereas the actual morbidity rates for these ages on the basis of past experience in the two counties are presented in column 2. Since the Dick reactions are based on 10,993 observations and the morbidity rates on approximately 128,925 person-years (see footnotes to table 2) and extending over a period of years the data assume significant proportions. The morbidity rate is highest at 7 years of age, indicating that at this age period the Dick positive state holds its greatest significance. Based on the Dick positive-scarlet fever morbidity ratio at the age of 7 the morbidity expect-

ancy for the other ages is as reported in column 3 of table 2. It will be seen that the expected rate is increasingly higher than the actual with advancing age until at the age of 15, for example, the actual rate is only approximately one-fifth of the expected. This fact should have weight when any active immunization program is considered. Undoubtedly, a similar relationship exists between the Schick reaction and diphtheria.

Since no active immunization work had been carried out in these two counties previous to the present study, any Dick negative children must have acquired their immunity through an attack of the disease or through one or more exposures to the streptococcus in subclinical degree. Reporting of clinically recognized cases in the two counties has been considered very good and it is known that an attack usually renders the individual Dick negative. From the data at hand it is possible, therefore, to calculate the percentage of the children at each age who probably became negative from an attack of the disease. Beginning with 2.9 percent at 6 years of age this percentage gradually increases by years, from 7 to 15, in the following manner: 4.2, 5.3, 6.1, 7.2, 7.9, 8.3, 9.5, 9.6, and 9.8. Similarly, the percentage of all the children at each year of age who probably became Dick negative through subclinical exposure is 41.0 at 6 years of age and 43.5, 50.4, 53.1, 56.2, 55.2, 58.9, 57.1, 61.6, and 57.7 for the succeeding years. These percentages will vary in a given community on the basis of the chance of exposure to the hemolytic streptococcus that has existed over a period of time.

TABLE 3.—*Influence of the size of the immunizing dose and the time interval since immunization on the immunity status as measured by the Dick test*

Elapsed time, months	Less than 5,000 S. T. D. of toxin			5,000–10,000 S. T. D. of toxin			13,750 or 16,000 S. T. D. of toxin		
	Total	Negative	Percent negative	Total	Negative	Percent negative	Total	Negative	Percent negative
1–2	172	96	55 8	439	362	82.4	1,008	842	83 5
21	28	15	53.6				325	287	88.3
23				89	65	73.0			
36–37	5	2					21	19	90 5
44–47	23	16	69.6	70	56	80 0	202	172	85.1

Durability of the negative Dick reaction.—Groups of treated children have been retested from time to time. The results of such retests are shown in table 3 where all those retested have been arranged without regard to age but on the basis of the elapsed time and the size of the immunizing dose. All children in these groups were Dick positive before beginning the immunizing doses. The retest figures bring out two rather unexpected facts: First, that a very considerable percentage of Dick positive children can be made Dick

negative with very small doses of purified and tannic acid precipitated toxin, and, second, that irrespective of the size of the immunizing dose the negative reaction, if once acquired, is retained for a considerable period of time.

The data in table 3 are based on the group as a whole and do not record what may happen to the individual child. Certain children were carried through two retests and a smaller group through three retests. These data are shown in table 4. The numbers involved in the second and third retests are not large except for those children receiving 13,750 or 16,000 S. T. D. of toxin. The latter group shows an actual increase in the number of Dick negative with each succeeding retest. The smaller immunizing doses appear to have been enough to maintain the negative level at least through a period of 44 to 47 months.

TABLE 4.—*Durability of immunity as measured by retests on the same persons following injections of purified and tannic acid precipitated toxin. (All persons were Dick positive when treatment began)*

a. First retest approximately 1 month after last immunizing dose

Size of immunizing dose, S. T. D.	Number retested	Number negative	Percent negative
4,000-5,000	172	96	55 8
6,000 9,000	439	362	82.4
13,750 16,000	1,008	842	83.5

b. Second retest 21 to 23 months after last immunizing dose

Size of immunizing dose, S. T. D.	First retest same children, percent negative	Result of second retest		
		Number	Negative	Percent negative
3,750	56.5	23	11	47.8
6,000 or 8,000	88 4	86	64	74 5
13,750 or 16,000	84.1	308	272	88.1

c. Third retest 44 to 47 months after last immunizing dose

Size of immunizing dose, S. T. D.	Previous retests on same children		Results of third retest		
	Percent negative first retest	Percent negative second retest	Number	Negative	Percent negative
3,750 or 4,000	37.5	25 0	8	3	37.5
7,000 or 8,000	86 4	81 8	22	18	81 8
13,750 or 16,000	78.8	85.9	85	74	87.1

The retest data have been analyzed in table 5 in an effort to show the constancy of the Dick reaction in succeeding retests irrespective of what it was on the first. It also has been possible to include in this table retest results on 341 children who were Dick negative in

the original test and therefore received no treatment. After a lapse of 45 months 331, or 97.1 percent, were still negative. For those who were Dick positive and received immunizing doses the probabilities of changes in the second retest over the first are somewhat greater, as is shown in table 5b. The variations in three retests are shown in table 5c.

TABLE 5.—*Variations in the Dick reaction as determined by second and third retests in the same individuals*

a. Retests on persons who were negative on the original tests

Elapsed time first to second tests	45 months.
Negative on first and second tests	331 or 97.1 percent.
Negative on first and positive on second	10 or 2.9 percent.

b. Positive on original test and given immunizing doses as indicated

Size of immunizing dose, S. T. D	5,000		7,000 or 8,000				13,750 or 16,000			
Elapsed time first to second retests	21 months		23 months		46 months		21 months		44 months	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Negative on first and second retests	18	41.8	58	67.4	48	71.6	235	76.3	119	66.1
Negative on first and positive on second	5	11.6	18	20.9	5	7.6	24	7.8	18	10.0
Positive on first and second retests	15	35.0	4	4.7	7	10.4	12	3.9	11	6.2
Positive on first and negative on second	[illegible]	11.6	6	7.0	7	10.4	37	12.0	32	17.7

c. Variations in the second and third retests over first retest

Size of immunizing dose, S. T. D	5,000	7,000 or 8,000	13,750 or 16,000	
			Number	Percent
All 3 tests in agreement	6	17	56	65.9
Second retest a reversal of first but in agreement with third	1	5	16	18.8
Second retest a reversal of first but in disagreement with third	1	0	13	15.3

Table 5 also permits a measurement of the permanence of the Dick negative state following active immunization as contrasted to that which has been acquired "naturally." It has just been stated that 97.1 percent of those "naturally negative" retained their status over a period of 45 months. Of 76 persons (table 5b) who received 7,000 or 8,000 S. T. D. and were negative on the first retest, 58, or 76.3 percent, retained the same reaction after 23 months whereas 48, or 90.6 percent out of a group of 53, were still negative after 46 months. When the immunizing dose was 13,750 or 16,000 S. T. D., 235, or 90.7 percent out of 259, still retained their negative skin reaction after 21 months, and after a lapse of 44 months, 119, or 86.9 percent of 137 children, were still negative. Thus those who acquired their im-

munity through hypodermic injections of toxin fell below those "naturally immune" in their ability to retain their immunity. However, the difference is not great and may not be significant. A very large majority of those naturally immune received their immunity through subclinical exposure. It is not unlikely that this group comprises those persons in the community who require the least amount of antigen for satisfactory antibody production.

TABLE 6.—*Influence of age on the probability of the Dick reaction becoming negative following the immunizing injections*

Age	Immunizing dose: 5,000 to 10,000 S. T. D.				Immunizing dose· 13,750 of 16,000 S. T. D.			
	Total	Negative	Percent negative		Total	Negative	Percent negative	
6	94	63	67.0		183	142	77.6	
7	93	62	66 7	70. 1	151	116	76 8	78. 7
8	79	65	82.3		152	119	79.4	
9	99	66	66 7		161	132	81 9	
10	72	60	83 4		.128	111	86.7	
11	64	56	87.6	84. 8	131	113	86.4	88 3
12	26	20	77 0		67	61	91.1	
13	9	9	100.0		34	33	97.0	

On retest 150 Dick positive student nurses showed 118 or 78 6 percent as negative.

A limited number of student nurses have been immunized with the purified and tannic acid precipitated antigen. Approximately 25 percent of these girls were Dick positive when they came to the hospital for the first time. Without reference to the elapsed time before the retest, 14 out of 16 Dick positive girls became negative after receiving less than 10,000 S. T. D. of antigen and 118, or 78.7 percent out of 150, became negative after receiving 10,000 to 25,000 S. T. D. Analysis of this latter group of 150 girls on the basis of the elapsed time before the retest shows that of 76 who were retested less than 6 months after the last immunizing dose 61, or 80.3 percent, had become negative. Of 74 others retested after an interval of 6 to 22 months 57, or 77.0 percent, were negative.

The number of children receiving the first retest after immunization was sufficiently large to indicate the influence of age on the probability of acquiring a negative reaction. The data presented in table 6 show that within the ages observed children became easier to render Dick negative as they grew older. However, with the 150 student nurses the percentage of Dick negatives obtained fell to the level of the 6-year-olds. It is probable that two factors exert an influence. The younger children have not had much immunity experience and thus as a group require greater antigenic stimulation, and, second, the ease with which the individual person produces antibodies varies greatly. Thus, in the younger ages, immunity is more difficult because of lack of immunity experience but this factor becomes

less dominant as the child experiences the close and multiple contacts of school life. On the other hand, with an adult population the residual of Dick positive persons probably represents for the most part those individuals who are poor antibody producers and are therefore difficult to immunize.

SCARLET FEVER MORBIDITY

The scarlet fever morbidity study period began December 1, 1936, and was closed on October 31, 1940. In each of the intervening years a group of newly immunized children was added to the study as soon after the opening of school as the injections could be completed (some time in October). Thus one group of children was observed for more than 3 years but less than 4, and other groups for 3 years, 2 years, and 1 year, respectively. For the purposes of statistical analysis the observations have been reduced to person-years. It will be seen from table 9 that a total of 41,109 person-years is included in the study group in addition to a control group.

Annual morbidity rates.—The annual morbidity rates for all ages for the two study counties, as well as the contiguous counties, are given in table 7. In general, the trends are the same in each county, namely downward, and irregular in character so that on an annual basis any influence of the immunizations given in the two study counties is not apparent.

TABLE 7.—*Annual scarlet fever morbidity rate per 1,000 for the two study counties and contiguous areas* [1]

Year	Maryland			Pennsylvania			West Virginia	
	Allegany	Garrett	Washington	Bedford	Fulton	Somerset	Mineral	Preston
1930	....	....	2.00	1.61	8.89	5.40	5.00	....
1931	5.20	....	2.24	1.65	9.71	4.66	5.81	....
1932	4.15	....	2.15	2.50	2.73	2.77	12.73	....
1933	2.87	....	2.95	5.16	2.59	1.68	5.39	3.09
1934	3.43	5.70	2.19	1.68	3.98	2.27	4.58	2.44
1935	2.45	5.45	1.43	1.43	2.71	2.24	2.95	5.01
1936	1.67	2.99	1.85	.30	2.38	.90	1.39	2.44
1937	1.30	3.85	1.37	1.08	4.89	2.40	1.48	1.74
1938	.91	3.58	.95	1.99	1.35	.77	2.38	2.02
1939	1.59	1.84	2.00	2.69	.48	.61	1.65	3.66

[1] Morbidity study period: Dec. 1, 1936, to Oct. 31, 1940.

Seasonal distribution.—As is to be expected, immunization in the two counties made no change in the monthly distribution of cases over the pre-immunization period.

Sex.—Endemic scarlet fever in preschool and school children shows no sex preference. Among adults endemic scarlet fever does show a social distinction in that parents of young children are more apt to become infected than other adults, and mothers more so than fathers.

In the two study counties, 57 and 68 percent, respectively, of the reported cases of scarlet fever in persons 18 years of age or over were in married women.

Age.—If the quantities of precipitated toxin used in this study afforded any protection against subsequent attacks of scarlet fever a change in the age distribution of reported cases would follow, since treatment was given only in the grammar school ages. Column 2 in table 8 gives the percentage of the total cases occurring at each year of age for the period before immunization. The peak of cases falls at 7 years of age (see also the morbidity rates in table 2). Column 4 gives similar figures for the study period. It will be seen that the peak of cases now falls in the fourth and fifth years of life. Children of these two ages surely represent the most vulnerable members of the community either above or below the ages included in the study group because of their degree of susceptibility and their social habits. A summary of the data in table 8 (see last 3 lines of table) shows that 61.9 percent of all the cases before immunization and 46.7 percent during the study period occurred in the age group 6–15 (both inclusive). Similarly, 24.6 percent and 37.8 percent, respectively, occurred in the group 5 years and under. On the basis of the percentage distribution in the pre-immunization period the expectancy for the 6–15-year group during the study period was 564 cases as against the 277 reported.

TABLE 8.—*Age distribution of reported cases of scarlet fever for the period before active immunization and for the study period*

Age	Period before immunization		During the study period	
	Cases	Percent	Cases	Percent
Under 1	10	0.58	12	2.02
1	26	1.50	3	.51
2	59	3.40	27	4.55
3	117	6.74	57	9.61
4	80	4.61	63	10.63
5	136	7.83	62	10.46
6	162	9.33	48	8.09
7	178	10.25	51	8.60
8	168	9.68	34	5.73
9	130	7.49	39	6.58
10	133	7.66	23	3.88
11	94	5.41	21	3.54
12	89	5.13	21	3.54
13	41	2.36	11	1.85
14	51	2.94	16	2.70
15	28	1.61	13	2.19
16	29	1.67	2	.34
17	20	1.15	8	1.35
18	15	.86	7	1.18
19	11	.63	7	1.18
20 and over	159	9.16	68	11.47
Total	1,736	100.0	593	100.0
Group 5 years and under	428	24.6	224	37.8
6–15 years (inclusive)	1,074	61.9	277	46.7
Over 15 years of age	234	13.5	92	15.5

Reported scarlet fever during the study period.—Table 9 gives the number of person-years observed in the various categories. The numbers are fairly large, especially in the group which was Dick negative on the original test and therefore was not treated, and the one which was Dick positive and then treated. These two groups have added significance since they were under observation for a

period of 44 to 47 months. The group which was treated without a preliminary Dick test represents children observed 3, 2, or 1 years (about equally divided). The last group, which is labeled "given 4,000 S. T. D. or less" is composed of those children who were present only for the first dose or the first and second doses. Since the number of children in this group is very small and the amount of antigen received inadequate, it is dropped from further consideration.

TABLE 9.—*Person-years included in the various groups*

Age	Control group	Entire study group	Dick negative group	Given 5,500-16,000 S.T.D.		Given 4,000 S.T.D. or less [1]
				Dick positive	No Dick test	
Under 5	33, 169	196	23	23	150	13
5	6, 605	528	47	43	438	50
6	4, 916	3, 271	474	405	2, 392	342
7	4, 179	3, 914	1, 099	897	1, 918	348
8	4, 272	4, 177	1, 878	1, 355	944	312
9	4, 171	4, 590	2, 624	1, 761	205	197
10	4, 123	4, 786	3, 029	1, 702	55	157
11	4, 280	4, 834	3, 175	1, 634	25	150
12	4, 799	4, 500	3, 080	1, 408	12	137
13	5, 336	3, 716	2, 654	1, 056	6	118
14	6, 768	2, 699	2, 021	672	6	76
15	7, 487	1, 670	1, 364	306		41
16	8, 129	921	860	61		17
17	7, 846	591	546	45		7
18	7, 715	361	339	22		3
19	6, 479	205	199	6		2
20 and over	329, 078	150	148	2		0
Total	450, 252	41, 109	23, 560	11, 398	6, 151	1, 970

[1] Not included in the totals for the entire study group.

Table 10 is a record of the cases of scarlet fever reported during the study period. Using the person-year data in table 9 and the case report data in table 10, morbidity rates in a standard population have been calculated in order to afford a common basis of comparison between the several study groups. Such rates for the grammar school ages are given in table 11. The standard population used represents the total school census population for the respective ages in the two counties at the close of the study. The rates for the control group given in column b represent the ratio occurring in that portion of the population which was neither Dick tested nor treated. This group comprises about 35 percent of the children at the ages indicated, and prior to the immunizing injections in the study group it was comparable with respect to susceptibility to scarlet fever to the remaining 65 percent included in the rates in column c, except that the control group probably contained a slightly higher percentage of Dick negative children. Parents whose children had had scarlet fever as a rule did not sign the consent slips. The rates arranged in column c represent the morbidity rates for children who were Dick negative (column d) on the original test, plus those Dick positive (column e) and given 5,500 to 16,000 S. T. D. of precipitated toxin and those treated with-

out regard to the skin reaction (column f). Therefore the rates in columns b and c are calculated on two groups of children similar except for the fact that the Dick positive portion of the study group received injections of precipitated toxin.

TABLE 10.—*Cases of scarlet fever reported for the study period*

Age	Control group	Entire study group	Dick negative group	Given 5,500–16,000 S. T. D.	
				Dick positive	No Dick test
Under 5	191	1			1
5	59	2			2
6	48	6	0		6
7	43	14	2	3	9
8	31	5	1	2	2
9	41	6	3	2	1
10	22	4	2	2	
11	20	2	1	1	
12	13	6	3	3	
13	12	1	1	0	
14	14	1	0		
15	14	0	0		
16	2	0			
17	11	0			
18	8	0			
19	8	0			
20 and over	73	0			

TABLE 11.—*The annual scarlet fever morbidity rates per 1,000 in the various groups calculated against a standard population*

Age	Standard population (a)	Untreated control group (b)	Study groups			
			Entire group (c)	Dick negative (d)	Immunizing dose 5,500 to 16,000 S. T. D.	
					Dick positive (e)	No Dick test (f)
6	2,208	9.76	1.83	0.00	0.00	2.51
7	2,152	10.29	3.58	1.82	3.34	4.71
8	2,207	7.25	1.20	.53	1.47	2.12
9	2,321	9.83	1.31	1.14	1.13	4.88
Total, 6–9	8,888	9.29	1.96	.87	1.47	3.56
10	2,299	5.33	.83	.66	1.17	
11	2,349	4.67	.41	.31	.62	
12	2,421	2.71	1.33	.97	2.13	
13	2,269	2.25	.27	.38	.00	
14	2,338	2.07	.00	.00	.00	
15	2,335	1.87	.00	.00	.00	
Total, 10–15	14,011	3.15	.48	.39	.66	

The morbidity evidence presented in table 10 confirms the Dick reaction data given in tables 3 to 6. The amount of immunizing substance injected caused approximately 80 to 90 percent of those treated to develop a negative Dick reaction, which, theoretically at least, means protection against scarlet fever. Similarly, table 11 shows that when the Dick positive children in the study group had received immunizing injections the subsequent scarlet fever attack

rate for the whole group remained definitely lower than in a control group composed of comparable persons. In the 6–9-year age group the attack rate was one-fifth that of the control rate and for the 10–15-year age group it was one-sixth. Failures occurred both in the Dick negative children (column d) and in those known to be Dick positive but treated (column e). It must be remembered that the control group (column b) comprises rates on both negative and positive reactors. If the Dick test could have been applied to the children of the control group at the beginning of the study as was done to the study group, the comparisons in table 11 would have been even more striking, as is suggested from the Dick positive rates given in table 1.

Thirteen cases of scarlet fever (table 10, column 3) occurred among those children who had a negative Dick reaction on original test. It was found (table 5) that 2.9 percent of such negative reactions revert to a Dick positive state in a 45-month interval. Using this reversion rate in the children included in column d and the expected attack rate in the resulting group, computed on the basis of other pertinent data previously presented, it is found that the expectancy is 9 cases in the Dick negative group against 13 which actually occurred.

Similarly, failures occurred with Dick positive children (table 11, column e) who were given immunizing doses. However, if corrections are made on the basis of the data presented in preceding tables it is found that the expected number of cases in this group is 23 cases as against 13 reported (table 10, column 4). Thus the actual morbidity rate for the Dick positive children who received injections is considerably less than is to be expected on the basis of the immunity obtained (table 6) as measured by the Dick reaction after immunizing.

The experience with the group of children who were given immunizing injections without a Dick test is not so satisfactory. Among children 6–9 years of age there were 5,459 person-years treated, and a total of 18 cases of scarlet fever was reported. The expectancy in this group is only 8 cases when calculated from the basic data presented in previous tables. Undoubtedly there was a good reason for this discrepancy, but a careful analysis of the available data does not reveal it. There was no grouping of the cases with respect to the elapsed time since the last immunizing dose (54 to 747 days) nor were the cases restricted as to age. Sixty-seven percent of the failures occurred in the 5-month period beginning in September 1939, whereas of the cases occurring in the control group only 22 percent developed during this interval. Consideration must be given to the possibility that a streptoccocus strain may have appeared for this short interval which was antigenically different from the NY–5 strain which was used both for the skin test toxin and the immunizing toxin. Unfortunately, cultures were not isolated from the failures and in this respect the study is weak.

There are certain other considerations which must be borne in mind when evaluating the Dick reaction reported on retesting the immunized children (tables 3 to 6) and when analyzing the reported cases of scarlet fever in the various categories (table 10). In interpreting the skin reactions no regard was given to the possibility of a false reaction due to reaction to the nonerythrogenic toxin portions of the test toxin. It is known that immunizing injections influence the chances of false reactions as does also age of the individual and previous exposure to the streptococcus. Similarly there is the possibility that partial immunity may alter the severity of an attack of scarlet fever and thereby render the clinical diagnosis more uncertain. The basis for the inclusion of cases in the various groups of table 10 was always the clinical opinion of the physician making the report, whether family doctor or health officer. Since laboratory assistance in diagnosis was not available in all cases, information of this character was not considered in any of the cases presented in table 10. The general tendency throughout the two counties was to make a definite diagnosis of scarlet fever even in doubtful cases, in order the better to protect the community.

Additional evidence of the protective value of the injections given is the experience in the communities along the western border of one of the counties studied (Garrett). A rather high percentage of all the children in this area had been receiving immunizing injections since the fall of 1935, whereas in the neighboring county of Preston, W. Va., none had been given. In the winter of 1939–40 an excess of approximately 100 cases of scarlet fever was reported for the school areas of Preston County, particularly those lying next to Garrett County. The usual free movement of persons between the various communities continued without restriction. Nevertheless, no case of scarlet fever developed in the nearby Garrett County schools and daily school inspection failed to reveal cases of septic sore throat or other communicable hemolytic streptococcus diseases.

DISCUSSION

This study of active immunization against scarlet fever and its influence on the incidence of this disease has brought out some important immunological facts which are applicable not only to scarlet fever but must also be equally applicable to other diseases having a similar basis for acquiring immunity.

First in this series of observations is the fact that the amount of antigen required in different individuals to change a reaction of susceptibility to one of immunity varies over a very wide range. In some of the individuals observed this was as low as a single injection of 750 S. T. D.; in others many times this amount was needed. For example, in a limited number of observations two separate courses of

injections, each totaling 13,750 S. T. D., failed to bring about a negative skin reaction. In one adult two separate courses of 13,500 S. T. D. and 18,500 S. T. D. were given, followed by an attack of clinical scarlet fever, and still the skin reaction remained positive, accompanied by a negative control test. However, as shown by the data presented in this study, a large majority of the susceptible children respond favorably to the injection of an amount of antigen which is within the range of practicability.

The data also show the converse to be true, namely, that the ease with which a negative skin reaction shifts back to positive is also subject to individual variation. However, a rather unexpected observation in this respect is that once the individual has acquired a negative reaction it appears to last nearly as long irrespective of the amount of antigen needed to bring it about. The negative reaction which is acquired through clinical or subclinical exposure appears to have somewhat greater permanency than that following injections of antigen, though this superiority is not altogether significant. The explanation for this may be (*a*) that those who acquire a negative reaction from subclinical exposure are those who are most easily immunized, or (*b*) that their stimulation is spread over a long period as contrasted to the brief period accompanying the injections.

Some evidence is presented which indicates that the positively reacting child of 6 is more difficult to render negative than are his schoolmates of 10 or 12 years of age. The increasing amount of immunity experience with each added year of contact with his fellows probably underlies this change. However, at a somewhat older age the remaining Dick positive group probably represents the residual of the persons who did not profit so readily by repeated subclinical exposures. The latter is suggested by the response to antigen injections obtained in a small group of student nurses.

It appears from the analysis of the morbidity data that a negative Dick reaction is a dependable index of protection against clinical scarlet fever. There appears to be no choice between a negative reaction acquired through clinical or subclinical experience which, in the latter instance at least, probably is experience with a heterologous group of strains or a negative reaction acquired from the injection of an antigen derived from a single strain of hemolytic streptococcus having the antigenic qualities of the NY-5 strain. The morbidity data show failures in both instances. However, an analysis, based on the data showing the durability of the negative phase in the various groups and that showing the percentage of reactors who become nonreactors following injections of the precipitated antigen, shows that the failures are not more frequent than could occur in persons who would be expected to revert to a positive reaction.

A comparison of the Dick reactions by individual ages in the grammar school group with the average-annual scarlet fever morbidity rates for the same ages over a period of years shows that a positive reaction does not bear the same significance at each age in terms of risk of contracting the disease. The risk to the individual in having a positive reaction grows progressively less with advancing age. The most obvious cause for this would seem to be the social and hygienic habits of the individual, though more obscure factors may also play a part. While this age difference is something to which the pediatrician need give little consideration in planning individual protection, it certainly is a significant factor for the health officer in planning community-wide protection and it shows the most advantageous point at which to concentrate his efforts.

Finally, consideration must be given to the practicability of the method used for the production of immunity. In this connection, many factors must be carefully weighed. But, in the final analysis, the degree of practicability can be evaluated by the response obtained from the children, parents, and teachers from year to year, by the percentage of those treated who become Dick negative and the durability of this phase, and finally by the protection afforded against the disease as indicated by the morbidity rates in the various categories. A review of the data accumulated during a 4-year study, which involved 41,109 person-years of observation in the study group and approximately the same number in a control group, shows that the interest and cooperation of the children, parents, and teachers have not fallen off, as indicated by the percentage of the children bringing signed consent slips from home and by the fact that the children, almost without exception, are voluntarily appearing for each of the three injections. The data show that approximately 85 percent of those treated became Dick negative and that few individuals subsequently lose this negative phase over a period of 44 to 47 months, while for the entire group there is actually an improvement in the percentage during this interval. The morbidity reports show that the injections afford protection against an attack of scarlet fever to the extent that they bring about a negative Dick test, and that the protection is as good as that afforded by the acquisition of a negative reaction through clinical or subclinical exposure.

The dosage, the injection method, and the time interval which seems both practicable and effective for children of grammar school age, when purified and tannic acid precipitated hemolytic streptococcus erythrogenic toxin (NY–5 strain) is used, is three graduated injections (750, 3,000, and 10,000 S. T. D.) spaced at 2-week intervals and injected in 0.1 cc. doses intradermally, preferably on the outer surface of the upper arm. When dealing with the individual a retest may be made one or more months after the last injection and if found

positive the third dose may be repeated. As a community procedure the children need not be retested, but if greater accuracy is desired they may be retested at the opening of school the following year. Immunized preschool children may be retested when entering school for the first time. Preschool and first grade children may receive the injections without a preliminary Dick test.

It is not considered necessary or advisable to attempt the immunization of persons beyond the grammar school age (in fact it is believed that as a community measure the procedure should be restricted to first grade children or younger) except when the occupation demands it, as, for example, student nurses. Since adults are more apt to react unfavorably to the nonspecific fraction of the precipitated toxin four doses are recommended (500, 2,000, 6,000, and 10,000 S. T. D.) but of the same volume and with the same interval between injections as with the three-dose method.

ACKNOWLEDGMENTS

The authors wish to express their appreciation of the enthusiastic cooperation of their associates, and also that of teachers and parents. They also wish to record the very considerable help given by Passed Assistant Surgeon J. W. Hornibrook.

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COURT DECISION ON PUBLIC HEALTH

Removal of garbage by city.—(Florida Supreme Court, Division B; *Clein* v. *Lee, City Manager et al.*, 200 So. 693; decided February 25, 1941.) The City of Miami, pursuant to authority, enacted an ordinance defining the term "garbage" and imposing a charge of $4 per annum on each family for its removal. The plaintiff, a resident of the city, refused to pay the charge and the city refused to remove his garbage. In a mandamus proceeding he sought to require the city to remove garbage from his premises but the supreme court affirmed the judgment of the lower court dismissing the proceeding. According to the appellate court the charge was not shown to be unreasonable and it was shown that 30,000 families in the city had complied with it. It was quite true, said the court, that the ordinance was a police measure and that the city was charged with the duty of protecting the health and sanitation of its people, but it could not perform this service and the other services which it was called upon to

perform without means to do so. Since the plaintiff had refused to pay the reasonable charge for the service, he had no ground for complaint.

DEATHS DURING WEEK ENDED APRIL 19, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 19, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,840	8,781
Average for 3 prior years	8,816	
Total deaths, first 16 weeks of year	149,653	149,771
Deaths per 1,000 population, first 16 weeks of year, annual rate	13.1	13.1
Deaths under 1 year of age	565	444
Average for 3 prior years	505	
Deaths under 1 year of age, first 16 weeks of year	8,604	8,198
Data from industrial insurance companies:		
Policies in force	64,570,519	65,744,323
Number of death claims	12,263	12,840
Death claims per 1,000 policies in force, annual rate	9.9	10.2
Death claims per 1,000 policies, first 16 weeks of year, annual rate	10.6	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED APRIL 26, 1941

Summary

The incidence of measles declined during the current week, with 50,609 cases reported as compared with 53,593 for the preceding week. A sharp increase was reported in Ohio, 7,182 cases as compared with 4,746 for the preceding week, but decreases were recorded in most of the other States. The highest current incidence, as indicated by case rates, continues to be reported from the Middle Atlantic, East North Central, and South Atlantic States.

A total of 62 cases of meningococcus meningitis was reported, the largest number for any corresponding week since 1937. Ten of these cases occurred in Virginia and 7 in Pennsylvania (2 in Luzerne County).

Of 16 cases of poliomyelitis, 3 were reported in Maryland, while only 3 other States reported more than 1 case each. A total of 405 cases has been reported to date this year (first 17 weeks), a larger number than was recorded for the corresponding period of each of the preceding 5 years with the exception of 1940 (414 cases). The South Atlantic States reported 103 of this total, 45 of which occurred in Florida.

For the current week, 3 cases of Rocky Mountain spotted fever were reported in Virginia, 1 case each in Delaware and South Dakota, and 13 cases in the Mountain States. To date this year 58 cases have been reported, most of which were in the Northwestern States, as compared with 31 cases in the corresponding period of 1940 and 42 in 1939.

For the current week, the incidence of diphtheria, scarlet fever, smallpox, and typhoid fever was below that for the corresponding period of each of the preceding 5 years.

Six cases of undulant fever were reported in Connecticut and 2 cases in Utah. Three cases of tularemia were reported in Utah and 1 case in Mississippi. Of 11 cases of endemic typhus fever, 4 occurred in Georgia and 1 in Massachusetts.

The death rate for the current week in 88 major cities in the United States was 11.6 per 1,000 population, as compared with 12.3 for the preceding week and a 3-year (1938–40) average of 11.9.

Telegraphic morbidity reports from State health officers for the week ended April 26, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40
	Apr. 26, 1941	Apr. 27, 1940		Apr. 26, 1941	Apr. 27, 1940		Apr. 26, 1941	Apr. 27, 1940		Apr. 26, 1941	Apr. 27, 1940	
NEW ENG.												
Maine	1	0	0	------	------	6	84	597	72	0	1	1
New Hampshire	0	0	0	------	------	------	49	15	31	0	0	0
Vermont	0	0	0	------	------	------	84	6	78	0	0	0
Massachusetts [1]	3	3	4	------	------	------	1,190	118	667	2	2	2
Rhode Island	3	3	0	------	------	------	3	188	72	0	0	0
Connecticut	3	0	1	5	1	3	380	41	109	0	0	0
MID. ATL.												
New York	13	24	30	[2] 12	[2] 16	[2] 15	6,513	812	1,705	4	1	8
New Jersey	3	6	15	34	10	8	3,586	608	608	3	2	2
Pennsylvania	11	28	33	------	------	------	5,789	330	1,014	7	12	9
E. NO. CEN.												
Ohio	8	7	17	12	54	27	7,182	25	209	1	1	3
Indiana	8	4	9	16	8	17	1,121	16	23	0	0	2
Illinois	17	19	35	12	9	41	2,812	104	104	3	3	3
Michigan [3]	0	2	8	14	14	6	3,581	674	420	0	0	2
Wisconsin	2	1	1	73	52	41	1,832	543	543	0	2	2
W. NO. CEN.												
Minnesota	3	0	2	4	------	------	47	120	212	0	0	0
Iowa	0	3	3	18	------	6	213	436	187	0	0	0
Missouri	1	8	8	7	4	23	529	13	32	1	0	3
North Dakota	7	1	0	9	9	9	45	14	14	0	0	0
South Dakota [4]	0	0	0	1	2	------	14	1	2	1	1	0
Nebraska	3	0	5	------	------	------	15	17	35	0	0	0
Kansas	6	8	9	7	8	18	1,064	630	95	1	0	0
SO. ATL.												
Delaware [4]	0	0	0	------	------	------	228	0	17	0	0	0
Maryland [3]	3	2	4	25	8	8	409	2	330	2	1	1
Dist. of Col.	0	3	5	------	------	1	370	1	75	0	0	1
Virginia [4]	8	9	11	430	175	175	2,235	184	423	10	0	1
West Virginia [3]	2	14	10	13	55	55	889	15	76	1	3	4
North Carolina	19	4	7	12	14	17	1,590	135	321	2	0	2
South Carolina [1]	2	4	5	328	270	264	639	12	44	1	0	1
Georgia [1]	3	10	6	358	28	53	734	68	68	1	0	1
Florida	5	2	4	77	9	8	606	99	99	1	0	0
E. SO. CEN.												
Kentucky	5	4	9	5	42	18	1,482	86	310	2	0	2
Tennessee	3	4	4	60	64	64	650	127	90	2	0	2
Alabama [1]	10	5	9	39	93	93	993	176	176	3	2	3
Mississippi [3]	5	1	5	------	------	------	------	------	------	2	1	0
W. SO. CEN.												
Arkansas	3	4	6	96	92	92	479	30	30	1	0	1
Louisiana [1]	6	8	8	2	12	21	67	12	17	0	0	0
Oklahoma	2	2	2	76	85	85	184	21	62	2	3	1
Texas [1]	22	22	31	530	387	479	1,160	1,260	406	5	1	3
MOUNTAIN												
Montana [4]	3	1	2	19	4	10	30	40	40	1	0	0
Idaho	0	0	0	1	------	2	23	37	37	0	0	0
Wyoming [4]	0	3	2	------	1	------	52	15	25	0	0	0
Colorado [4]	11	9	9	14	9	------	445	26	38	0	0	0
New Mexico	1	1	2	1	------	------	214	30	42	0	0	0
Arizona	0	2	2	73	96	69	110	89	89	0	0	0
Utah [3]	1	1	1	7	10	------	36	750	93	0	0	0
Nevada	0	------	------	------	------	------	1	------	------	0	------	------
PACIFIC												
Washington	3	0	0	------	------	------	103	792	327	0	0	0
Oregon	4	4	2	11	9	29	364	603	75	0	1	1
California [1]	18	11	25	272	68	74	383	397	812	3	0	1
Total	231	247	393	2,673	1,718	1,718	50,609	10,315	13,103	62	37	57
17 weeks	4,827	5,970	8,477	582,564	159,244	138,406	539,363	118,620	154,697	853	691	1,416

See footnotes at end of table.

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Telegraphic morbidity reports from State health officers for the week ended April 26, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Apr. 26, 1941	Apr. 27, 1940		Apr. 26, 1941	Apr. 27, 1940		Apr. 26, 1941	Apr. 27, 1940		Apr. 26, 1941	Apr. 27, 1940	
NEW ENG.												
Maine	0	0	0	3	10	10	0	0	0	0	0	0
New Hampshire	0	0	0	1	2	4	0	0	0	0	0	1
Vermont	0	0	0	20	13	7	0	0	0	0	1	0
Massachusetts [1]	0	0	0	222	166	238	0	0	0	1	3	2
Rhode Island	0	0	0	6	6	19	0	0	0	0	0	0
Connecticut	0	0	0	74	119	107	0	0	0	2	3	1
MID. ATL.												
New York	0	2	0	433	977	834	0	0	0	7	9	9
New Jersey	0	0	0	267	396	246	0	0	0	0	6	3
Pennsylvania	1	1	1	393	476	476	0	0	0	7	7	7
E. NO. CEN.												
Ohio	1	1	1	261	505	442	0	0	0	1	3	6
Indiana	0	0	0	118	217	177	0	3	10	0	1	1
Illinois	0	0	1	313	818	725	1	3	19	1	11	4
Michigan [3]	[5] 0	3	0	250	326	412	0	4	5	1	4	4
Wisconsin	1	0	0	114	97	185	14	2	5	0	4	2
W. NO. CEN.												
Minnesota	0	0	0	38	72	160	3	3	5	1	1	0
Iowa	0	0	0	50	66	166	6	26	40	2	1	1
Missouri	0	0	0	98	37	161	3	8	18	0	1	2
North Dakota	0	0	0	2	13	14	0	3	8	0	0	0
South Dakota [4]	0	0	0	18	14	15	0	0	7	0	0	0
Nebraska	0	0	0	15	19	39	0	0	14	0	0	0
Kansas	0	0	0	33	75	105	0	0	13	0	1	1
SO. ATL.												
Delaware [4]	0	0	0	38	11	6	0	0	0	0	0	0
Maryland [3]	3	0	0	40	32	48	0	0	0	0	2	1
Dist. of Col	0	0	0	8	30	18	0	0	0	1	0	0
Virginia [4]	1	0	0	31	33	30	0	0	0	3	0	5
West Virginia [3]	0	0	0	34	52	41	0	0	0	4	0	2
North Carolina	0	0	0	26	32	28	0	1	1	3	0	2
South Carolina [1]	0	0	1	1	2	2	0	0	0	2	2	4
Georgia [1]	0	0	0	18	6	6	0	0	0	1	3	3
Florida	2	0	0	6	7	6	0	1	0	1	0	2
E. SO. CEN.												
Kentucky	0	0	0	87	83	42	0	1	1	4	2	3
Tennessee	0	0	0	65	74	28	0	0	0	2	0	2
Alabama [1]	2	0	1	17	12	6	0	1	2	1	4	4
Mississippi [3]	0	1	0	7	9	4	2	0	0	5	0	2
W. SO. CEN.												
Arkansas	0	0	0	7	5	6	1	3	4	1	0	1
Louisiana [1]	[5] 0	0	1	5	5	9	1	0	0	8	6	6
Oklahoma	0	0	0	8	12	24	0	1	3	0	0	4
Texas [1]	1	2	0	102	26	39	3	6	6	6	5	8
MOUNTAIN												
Montana [4]	2	0	0	42	29	29	1	0	4	0	1	1
Idaho	0	0	0	11	7	9	0	0	5	0	1	1
Wyoming [4]	0	0	0	12	8	7	0	0	1	0	1	0
Colorado [4]	0	0	0	20	44	58	0	1	1	1	0	0
New Mexico	0	0	0	5	23	23	0	1	0	0	1	1
Arizona	0	0	0	12	6	13	0	0	0	1	1	1
Utah [3]	0	0	0	10	13	26	0	2	1	0	0	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	0	0	15	41	35	2	0	10	0	0	2
Oregon	0	0	0	13	11	31	9	0	16	0	1	1
California [1]	1	3	3	145	133	170	0	6	17	9	5	6
Total	16	13	16	3,514	5,170	5,170	46	76	363	76	91	117
17 weeks	405	414	347	63,230	81,757	100,393	752	1,237	5,485	1,282	1,346	1,880

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended April 26, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended Apr. 26, 1941	Whooping cough, Week ended Apr. 27, 1940
NEW ENG.		
Maine	19	16
New Hampshire	0	40
Vermont	14	0
Massachusetts [1]	215	150
Rhode Island	20	9
Connecticut	73	32
MID. ATL.		
New York	348	332
New Jersey	103	113
Pennsylvania	375	215
E. NO. CEN.		
Ohio	365	257
Indiana	39	37
Illinois	72	114
Michigan [5]	318	196
Wisconsin	119	80
W. NO. CEN.		
Minnesota	121	41
Iowa	39	29
Missouri	59	4
North Dakota	23	16
South Dakota [4]	17	0
Nebraska	24	3
Kansas	116	43
SO. ATL.		
Delaware [4]	8	5
Maryland [3]	112	140
Dist. of Col.	22	22
Virginia [4]	131	31
West Virginia [3]	54	35
North Carolina	349	76
South Carolina [1]	171	20
SO. ATL.—continued		
Georgia [1]	28	5
Florida	23	32
E. SO. CEN.		
Kentucky	95	84
Tennessee	55	32
Alabama [1]	107	18
Mississippi [3]	-------	-------
W. SO. CEN.		
Arkansas	38	33
Louisiana [1]	8	63
Oklahoma	37	9
Texas [1]	229	318
MOUNTAIN		
Montana [4]	16	4
Idaho	9	7
Wyoming	3	0
Colorado	191	16
New Mexico	26	144
Arizona	34	31
Utah [4]	55	134
Nevada	0	-------
PACIFIC		
Washington	145	81
Oregon	28	20
California [1]	683	455
Total	5,136	3,542
17 weeks	74,833	51,872

[1] Typhus fever, week ended April 26, 1941, 11 cases, as follows: Massachusetts, 1; South Carolina, 1; Georgia, 4; Alabama, 1, Louisiana, 1; Texas, 2; California, 1.
[2] New York City only.
[3] Period ended earlier than Saturday.
[4] Rocky Mountain spotted fever, week ended April 26, 1941, 18 cases as follows South Dakota, 1; Delaware, 1; Virginia, 3; Montana, 9; Wyoming, 3; Colorado, 1.
[5] One case of poliomyelitis reported in Michigan for the week ended March 29, 1941, and 2 cases in Louisiana for the succeeding week, although not listed in the tables as in those States, were included in the totals published for the two weeks, 20 and 21 cases respectively (Public Health Reports, April 4, p. 744, and April 11, p. 808).

WEEKLY REPORTS FROM CITIES

City reports for week ended April 12, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	115	266	78	5,419	698	2,104	22	394	20	1,210	--------
Current week [1]	61	141	42	16,773	415	1,592	2	350	13	1,155	--------
Maine:											
Portland	0	------	0	2	7	1	0	0	0	16	29
New Hampshire:											
Concord	0	------	0	0	0	1	0	1	0	0	12
Manchester	0	------	0	0	0	3	0	0	0	0	17
Nashua	0	------	0	0	0	0	0	0	0	1	8
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	2
Burlington	0	------	0	5	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	1	0	0	0	0	10
Massachusetts:											
Boston	2	------	0	403	15	83	0	13	0	51	206
Fall River	0	------	0	0	3	6	0	0	0	1	29
Springfield	3	------	0	8	0	21	0	2	0	1	32
Worcester	0	------	0	42	7	12	0	1	0	10	54
Rhode Island:											
Pawtucket	0	------	0	0	0	1	0	0	0	2	16
Providence	0	1	1	2	2	4	0	2	0	12	73
Connecticut:											
Bridgeport	0	1	1	6	3	8	0	1	0	1	35
Hartford	1	------	0	1	2	4	0	1	0	3	26
New Haven	0	------	0	1	2	11	0	0	0	0	45
New York:											
Buffalo	0	------	0	107	6	48	0	6	0	10	140
New York	18	18	4	5,579	68	378	0	81	1	74	1,493
Rochester	0	------	0	237	4	1	0	0	0	21	67
Syracuse	0	------	0	0	0	3	0	0	0	5	50
New Jersey:											
Camden	0	------	0	10	5	16	0	0	0	1	24
Newark	0	4	0	186	3	41	0	3	0	14	84
Trenton	0	------	0	60	0	33	0	2	0	0	39
Pennsylvania:											
Philadelphia	1	5	3	1,256	22	102	0	26	1	31	423
Pittsburgh	2	3	2	645	7	22	0	5	0	55	152
Reading	0	------	0	97	2	5	0	0	0	2	18
Scranton	0	------	--------	13	-------	1	0	-------	0	0	--------
Ohio:											
Cincinnati	1	------	0	367	3	15	0	6	0	8	133
Cleveland	1	4	0	1,141	8	31	0	16	0	71	193
Columbus	0	1	1	269	3	27	0	3	0	14	83
Toledo	0	------	0	72	4	6	0	2	0	17	80
Indiana:											
Anderson	0	------	1	3	1	1	0	0	0	0	14
Fort Wayne	0	------	0	60	1	1	0	0	0	0	19
Indianapolis	2	------	1	450	10	12	0	3	0	3	108
Muncie	0	------	0	60	1	17	0	0	0	2	10
South Bend	0	------	0	0	0	0	0	0	0	0	22
Terre Haute	1	------	1	2	0	2	0	0	0	0	21
Illinois:											
Alton	0	------	0	0	1	1	0	3	0	4	8
Chicago	7	3	2	1,389	28	196	0	32	1	28	696
Elgin	0	------	0	180	0	0	0	0	0	0	15
Moline	0	------	0	32	0	2	0	0	0	0	8
Springfield	0	3	0	5	1	7	0	0	0	0	19
Michigan:											
Detroit	2	2	1	969	15	171	0	13	0	129	277
Flint	0	------	0	166	4	3	0	1	0	7	83
Grand Rapids	0	------	0	461	2	8	0	1	0	3	84
Wisconsin:											
Kenosha	0	------	0	203	0	0	0	0	0	0	7
Madison	0	------	0	59	0	14	0	0	0	1	7
Milwaukee	0	------	0	352	2	19	0	2	0	29	80
Racine	0	------	0	54	0	4	0	0	0	4	12
Superior	0	------	0	0	0	3	0	0	0	0	6

[1] Figures for Tampa and Boise estimated; reports not received.

City reports for week ended April 12, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0		0	1	1	0	0	0	0	22	17
Minneapolis	0		0	2	3	15	0	0	0	18	75
St. Paul	0	1	1	1	7	10	0	1	0	13	65
Iowa:											
Cedar Rapids	0			9		1	0		0	0	
Davenport	0			10		1	0		0	0	
Des Moines	0			13		7	0		0	0	30
Sioux City	0			2		0	0		0	2	
Waterloo	0			36		1	0		0	2	
Missouri:											
Kansas City	0		1	55	8	5	0	4	0	24	107
St. Joseph	0		0	18	7	0	0	1	0	0	26
St. Louis	0		0	295	10	89	0	4	1	30	174
North Dakota:											
Fargo	0		0	2	1	0	0	0	0	23	7
Grand Forks	0			0		0	0		0	0	
Minot	0			1		0	0		0	0	3
South Dakota:											
Aberdeen	0			0		1	0		0	0	
Sioux Falls	0			0		2	0		0	0	6
Nebraska:											
Lincoln	0			0		4	0		0	1	
Omaha	0		0	2	4	5	1	3	0	2	58
Kansas:											
Lawrence	0		0	26	0	1	0	0	0	6	6
Topeka	0		0	237	1	0	0	0	0	7	9
Wichita	1	2	0	4	3	1	0	0	0	10	41
Delaware:											
Wilmington	0		0	49	3	14	0	0	0	2	30
Maryland:											
Baltimore	1	4	0	108	30	19	0	10	0	56	262
Cumberland	0		1	1	0	0	0	0	0	1	17
Frederick	0		0	1	0	2	0	0	0	3	5
Dist. of Col.:											
Washington	0	1	1	341	13	18	0	12	3	18	159
Virginia:											
Lynchburg	0		0	1	3	0	0	3	0	1	14
Norfolk	0		0	194	3	1	0	1	0	7	28
Richmond	0		0	77	6	2	0	3	0	0	48
Roanoke	0		1	72	1	1	0	0	0	3	16
West Virginia:											
Charleston	1	1	1	2	7	1	0	0	0	0	27
Huntington	2			78		0	0		0	3	
Wheeling	0		0	14	2	0	0	0	0	1	21
North Carolina:											
Gastonia	0		0	24	0	0	0	0	0	10	
Raleigh	0		0	162	3	0	0	1	0	33	17
Wilmington	0		0	2	2	0	0	1	0	7	16
Winston-Salem	0		0	23	2	1	0	1	0	2	15
South Carolina:											
Charleston	0	22	0	37	3	0	0	3	1	3	25
Florence	0	7	0	12	1	0	0	0	0	4	10
Greenville	0		0	60	3	0	0	0	0	10	10
Georgia:											
Atlanta	1	1	0	18	4	0	0	4	0	3	86
Brunswick	0		0	51	0	0	0	0	0	0	7
Savannah	1	10	2	26	3	5	0	1	1	0	32
Florida:											
Miami	0	2	1	20	1	0	0	0	0	4	48
St. Petersburg	0		0	88	1	0	0	2	0	0	29
Tampa											
Kentucky:											
Ashland	0		1	2	0	0	0	0	0	2	8
Covington	0		0	0	1	0	0	2	0	0	17
Lexington	0		0	3	2	0	0	1	0	3	18
Louisville	0		0	849	3	80	0	6	0	9	81
Tennessee:											
Knoxville	0		0	106	1	12	0	1	0	8	29
Memphis	0		3	95	3	4	0	3	0	7	80
Nashville	0		1	88	2	5	0	1	0	9	55
Alabama:											
Birmingham	0	2	1	32	2	3	0	5	1	0	74
Mobile	0	4	3	3	0	0	0	0	0	0	27
Montgomery	0	1		28		0	0		0	0	

City reports for week ended April 12, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	1	------	2	------	1	0	------	0	0	------
Little Rock	0	12	1	14	0	2	0	3	0	1	19
Louisiana:											
New Orleans	0	2	1	39	12	2	1	7	0	8	135
Shreveport	1	------	0	1	4	0	0	1	0	0	42
Oklahoma:											
Oklahoma City	0	4	1	5	2	4	0	2	0	0	41
Tulsa	0	------	0	67	3	1	0	1	0	19	25
Texas:											
Dallas	4	1	1	36	4	9	0	3	0	1	72
Fort Worth	2	------	0	75	2	5	0	1	0	1	38
Galveston	0	------	0	2	1	1	0	1	0	0	13
Houston	1	------	0	0	5	0	0	4	1	0	68
San Antonio	1	2	3	0	0	1	0	10	0	0	70
Montana:											
Billings	0	------	0	1	0	0	0	0	0	0	8
Great Falls	1	------	0	4	0	2	0	0	0	0	13
Helena	0	------	0	1	0	4	0	0	0	0	2
Missoula	0	------	0	0	0	1	0	0	0	0	3
Idaho:											
Boise	------	------	------	------	------	------	------	------	------	------	------
Colorado:											
Colorado Springs	0	------	0	1	0	4	0	0	0	4	8
Denver	3	11	0	258	2	8	0	3	0	81	82
Pueblo	0	------	0	2	0	1	0	0	0	24	8
New Mexico:											
Albuquerque	0	------	0	6	3	1	0	0	0	0	11
Utah:											
Salt Lake City	0	------	0	4	0	3	0	0	0	11	30
Washington:											
Seattle	0	------	0	0	1	4	0	5	0	6	94
Spokane	0	------	0	12	2	1	0	0	0	0	43
Tacoma	0	------	0	0	1	0	0	0	1	6	35
Oregon:											
Portland	1	3	0	18	2	4	0	2	0	2	72
Salem	0	------	0	1	0	0	0	0	0	0	------
California:											
Los Angeles	0	12	2	44	6	47	0	22	0	41	300
Sacramento	1	------	0	2	1	5	0	3	0	7	27
San Francisco	2	7	0	0	5	1	0	5	1	58	170

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Maryland:			
Boston	2	0	0	Baltimore	2	1	1
New York:				Florida:			
New York	3	2	0	Miami	0	0	5
Pennsylvania:				Tennessee:			
Philadelphia	1	0	0	Memphis	0	1	0
Ohio:				Oklahoma:			
Cleveland	1	0	0	Tulsa	1	0	0
Michigan:							
Detroit	2	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Topeka, 1. Deaths: New York, 2; Springfield, Ill., 2; Topeka, 1.

Pellagra.—Cases: Chicago, 1; Charleston, S. C., 4; Savannah, 2; New Orleans, 1.

Typhus fever.—Cases: Baltimore, 1; Atlanta, 1; Savannah, 1; Montgomery, 1, Houston, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 22, 1941.—During the week ended March 22, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		13	2	7	12	4	3	1	3	45
Chickenpox		3	2	195	301	52	15	15	54	637
Diphtheria	8	12		14	1	3	2			40
Influenza		38			9	1			13	61
Lethargic encephalitis					1					1
Measles		176	73	292	1,390	107	264	272	1,136	3,710
Mumps				346	286	36	35	16	25	744
Pneumonia		22			12	2			6	42
Scarlet fever		26	6	82	209	10	2	27	11	373
Smallpox							1			1
Tuberculosis	5	20	8	45	60	3	7			148
Typhoid and paratyphoid fever			2	29	2			2		35
Whooping cough				162	189	2	2	4	25	384

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended September 28, 1940.—During the 13 weeks ended September 28, 1940, cases of certain infectious diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	11,225	Puerperal pyrexia	1,891
Dysentery	613	Scarlet fever	17,737
Ophthalmia neonatorum	1,252	Typhoid and paratyphoid fever	1,418
Pneumonia	5,539		

England and Wales—Vital statistics—Third quarter 1940.—The following vital statistics for the third quarter of 1940 for England and Wales are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar General and are provisional:

	Number	Annual rate per 1,000 population		Number	Annual rate per 1,000 population
Live births	149, 249	14. 3	Deaths from—Continued.		
Stillbirths	5, 354	. 51	Influenza	269	0. 03
Deaths, all causes	108, 880	10. 9	Measles	169	. 02
Deaths under 1 year of age	6, 316	[1] 42	Scarlet fever	39	. 00
Deaths from:			Typhoid and paratyphoid fever	39	. 00
Diarrhea and enteritis (under 2 years of age)	718	4. 8	Whooping cough	116	. 01
Diphtheria	559	. 06			

[1] Per 1,000 live births.

NOTE.—The above deaths include only civilians.

SWITZERLAND

Notifiable diseases—January 1941.—During the month of January 1941, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	40	Paratyphoid fever	5
Chickenpox	189	Poliomyelitis	11
Diphtheria and croup	109	Scarlet fever	357
German measles	36	Tuberculosis	254
Influenza	227	Typhoid fever	5
Lethargic encephalitis	1	Undulant fever	5
Measles	412	Whooping cough	184
Mumps	110		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of April 25, 1941, pages 924-928. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Thailand—Lampang Province.—During the week ended April 5, 1941, 1 fatal case of plague was reported in Lampang Province, Thailand.

Typhus Fever

Switzerland—Zurich.—During the week ended March 22, 1941, 1 case of typhus fever was reported in Zurich, Switzerland.

X

Public Health Reports

VOLUME 56 MAY 9, 1941 NUMBER 19

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

March 23–April 19, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended April 19, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—While the incidence of influenza decreased almost 50 percent during the 4 weeks ended April 19, the number of cases (17,745) was about 40 percent above the number recorded for the corresponding period in 1940, and about 30 percent above the 1936–40 median incidence for this period. The current excess was due largely to the relatively high incidence in the South Atlantic and West South Central regions. There were minor excesses in the Middle Atlantic, Mountain, and Pacific regions, but in the New England, North Central, and East South Central regions the incidence had dropped below the expected seasonal incidence.

Measles.—The number of cases of measles rose from approximately 156,000 during the 4 weeks ended March 22 to approximately 219,000 during the 4 weeks ended April 19. The current incidence is the highest on record for this period. In 1938, 1935, and 1934, other years in which measles was epidemic, the cases for the corresponding period totaled approximately 149,000, 143,000, and 132,000 respectively. The average for this period for nonepidemic years is about 45,000 cases. In the New England and Pacific regions the incidence was relatively low and the Mountain region reported only about a 20-percent increase over the normal seasonal incidence, but all other regions reported very significant increases. In the East North Central region the number of cases (77,544) was more than 17

times the 1936–40 median; in the East South Central region the incidence (12,154 cases) was more than 9 times the average incidence; the South Atlantic region reported more than 5 times the expected incidence; the other regions reported minor excesses.

Poliomyelitis.—The number of cases of poliomyelitis (75) was about 20 percent in excess of the number reported in 1940, but it was only slightly above the seasonal expectancy. The 14 cases reported from Florida were mostly responsible for a significant increase over the normal incidence in the South Atlantic region, but in all other regions the situation compared very favorably with the average of preceding years.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period Mar. 23–Apr. 19, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza[1]			Measles[2]		
United States	1,104	1,055	1,601	17,745	12,584	14,019	218,982	38,323	49,742
New England	37	24	32	27	30	58	4,929	5,463	6,609
Middle Atlantic	155	175	336	154	92	125	67,213	5,670	17,035
East North Central	202	142	317	976	1,074	1,176	77,544	4,069	4,456
West North Central	82	83	122	303	169	577	7,223	4,354	4,354
South Atlantic	176	235	265	5,060	4,240	4,240	34,209	2,469	6,677
East South Central	88	86	103	1,887	1,262	2,400	12,154	1,280	1,280
West South Central	210	152	203	7,821	4,543	4,543	8,672	3,936	3,459
Mountain	70	66	64	706	663	663	3,832	3,291	3,291
Pacific	84	92	100	1,311	511	1,232	3,206	7,791	7,791
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	225	157	275	75	64	71	16,960	20,480	22,129
New England	14	4	15	3	0	1	1,253	1,804	1,829
Middle Atlantic	52	45	52	3	4	8	5,470	7,377	7,377
East North Central	25	16	35	10	9	9	5,632	7,429	7,429
West North Central	8	8	19	6	5	5	1,245	1,158	2,823
South Atlantic	56	27	54	24	10	10	871	846	871
East South Central	41	24	62	9	6	7	1,084	813	416
West South Central	16	22	22	10	11	11	374	281	619
Mountain	2	2	9	4	7	4	451	494	619
Pacific	11	9	12	6	12	12	580	778	1,079
	Smallpox			Typhoid and paratyphoid fever			Whooping cough[2]		
United States	146	277	1,267	291	339	443	18,695	13,592	[3] 14,592
New England	0	0	0	12	14	20	1,291	1,024	1,024
Middle Atlantic	0	0	0	47	61	61	3,016	3,276	3,423
East North Central	57	37	321	25	50	50	3,705	2,286	2,794
West North Central	48	129	558	8	24	19	1,593	443	443
South Atlantic	8	6	6	94	43	81	3,081	1,942	2,265
East South Central	0	18	18	23	48	48	748	636	513
West South Central	19	33	44	50	51	112	1,596	1,399	1,399
Mountain	0	39	91	12	26	15	1,122	864	864
Pacific	14	15	114	20	23	30	2,543	1,722	1,722

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] 3-year (1938–40) median.

Whooping cough.—The incidence of whooping cough was also relatively high. Each region except the Middle Atlantic reported an excess over the 1938–40 median incidence. The greatest excesses were reported from the North Central, South Atlantic, and Pacific regions.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The incidence of diphtheria was slightly higher than during the corresponding period in 1940, but the number of cases (1,104) reported for the 4 weeks ended April 19 was only about 70 percent of the 1936–40 median figure for this period. The East North Central and West South Central regions reported considerable increases over last year, and a 50-percent increase was reported in the New England region, but only the New England, West South Central, and Mountain regions reported excesses over the preceding 5-year median incidence.

Meningococcus meningitis.—The number of reported cases of meningococcus meningitis was 225, as compared with 157, 176, and 275 for the corresponding period in 1940, 1939, and 1938, respectively. The incidence was approximately 40 percent above that of last year, but it was about 20 percent below the average seasonal incidence. Pennsylvania reported 29 cases; New York and Mississippi, 18 each; Virginia, 16; Maryland, 12; and Michigan, 10 cases. More than 45 percent of the total cases were reported from those six States.

Scarlet fever.—The incidence of scarlet fever reached a new low level for this period. The total number of cases (16,960) was less than 80 percent of the number recorded for the corresponding period in 1940 and approximately 75 percent of the median expectancy for the period. Kentucky, with 605 cases, and Tennessee, with 397 cases, seemed mostly responsible for an excess of cases in the East South Central region, the only region reporting an excess over the 1936–40 median incidence for this period.

Smallpox.—The number of cases (146) of smallpox reported for the current period was also relatively low, being only about 50 percent of the record low level established for this period in 1940, when a total of 277 cases was reported. The situation was favorable in all sections of the country.

Typhoid fever.—The incidence of typhoid fever also reached a new low level, the current incidence (291 cases) being the lowest recorded for this period in the 13 years for which these data are available. The South Atlantic region reported a slightly higher incidence than might normally be expected, but in all other regions the incidence was relatively low.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended April 19, based on data received from the Bureau of the Census, was 12.0 per 1,000 inhabitants (annual basis). The rate for the corresponding period in 1941 was 12.3 and the 1938–40 average rate was 12.4.

SPECIAL PROBLEMS IN OUR HEALTH DEFENSES *

By Paul V. McNutt, *Administrator, Federal Security Agency, Coordinator, Health Welfare, and Related Activities, National Defense Council*

This Conference has probably never met under graver circumstances. Under any circumstances I should be gratified to speak to this group, and, as it is, I am keenly conscious of being admitted to the inner councils of the health officers of the Nation during a time of crisis.

Our friends from the Provincial Health Authorities of Canada were never more welcome than they are this year. Not only are we glad to see them for their own sakes, but we turn to them with the interest and understanding that come from a sense of common aims and of fealty to one another in pursuing them. The manner of life in our North American household has been disrupted by the events across the way. The noise of the destruction is growing louder and more ominous. In the din and the loud voices and the threats launched at us, we have discovered that we have a way of life in which we believe and which we shall not allow to be destroyed.

I think that this Conference, which yearly marks the course of a Federal-State partnership in the cause of health, is one of the most interesting of those meeting in Washington. Though it is perhaps not old enough to be called hoary, it is certainly old enough to be described as an honored tradition. This year it is a necessity in the complex business of maintaining and increasing the Nation's health and the morale that goes with it. For within the past year health has become important to our defenses and our task has taken on complications.

In happier national circumstances I should devote the time we have together to recounting improvements in the general level of public health and professional competence. As head of the Federal Security Agency, I have followed your administrative and professional achievements. I have taken a great personal, as well as an official, interest in them, and I share your pride of accomplishment.

The times are too stern for us to linger over what has been done and to be glad. But I should like to say that I have been greatly interested in the story of the Federal-State partnership for national

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health and in the balance of authority which has been so nicely evolved. The partnership was entered into with the role of the Federal Government defined, by inference at least, as one of last resort. The basic Quarantine Act of 1890 carried the restriction that Federal action should be taken when the President was satisfied as to the danger of the spread of diseases across State lines. So began the combined efforts of the Federal Government and the States to fight the epidemic diseases. Each supplemented the rather meager resources of the other during what may be termed the lean years of public health. The partnership grew in its capacity for reciprocity—which is another expression for wisdom—and finally matured into a dynamic force for national health with the passage of the Social Security Act in 1935 and the Venereal Disease Control Act in 1938.

Under the perhaps guileless impression that we would be forever free to work for the good life, we nourished this partnership. Now we turn to the work of defending health on the fringes of a great world war.

There is work waiting for the health officers of this continent. As Coordinator of Health, Welfare, and Related Activities in the National Defense Council, I speak from a unique vantage point. There, I am obliged to take the wide view of our activities and our problems. I cannot make specific recommendations as to this, that, and the other thing which must be done in public health. You are the specialists. But I should like to call your attention to the immediate problems which I see from my vantage point.

Defense may be likened to a wedge. At the apex is the soldier. This is one of the stages in history when the man who does the fighting steps up as the most significant of human units. This man must have the paraphernalia of war and, as the living unit necessary to the business, he must be fed and clothed and kept in good health. The military authorities are primarily responsible for the details of his existence. They are responsible for safeguarding his health in the limited areas over which they have jurisdiction.

But a good part of the soldier's time is spent in the surrounding civil communities. Even the briefest of times could be significant, since one can pick up an infection very fast. This is where public health comes in. Last summer, in the maneuver areas, we began our task of resolving the public health problems which impartially plague both military and civil populations. Early in the fall, nine Public Health Service officers were assigned as liaison officers to the nine Army Corps Areas to facilitate the relationship between the civil and military authorities.

To solve the public health problems in environmental sanitation, food and milk sanitation, communicable disease control (especially

malaria in certain areas), and venereal disease control involves traditional public health services. This part of the work we have pretty well in hand. Money has already been provided for it and more will be forthcoming.

I might say that we started quite logically by sending experts to look into the situation. Since last fall, as you all know, the Public Health Service has had teams of physicians and engineers doing public health reconnaissance, and they have been reporting on areas where military or industrial activities have produced dangerous situations.

Trained personnel from the Public Health Service are being sent into these areas on what has been termed a "lend-lease" basis to assist in the work of our health defense.

Always during emergencies the venereal diseases step forward with the intention of complicating a bad situation. It would be ironical, now that we have developed methods of control, if we allowed them to do so in this emergency. Our efforts to control these diseases must be intensified.

As I say, these traditional services—in sanitation and communicable disease control—we have pretty well under control. And we should have, for public health has the structure and is an old hand at the work.

It seems to me, however, that there are two or three problems of grave import which are not under control. In fact, we have scarcely faced the situations realistically.

The military services are responsible for the soldier, but public health is responsible for his ally, the industrial worker. In today's war, industrial mobilization and expansion make possible military mobilization and expansion. In the speeding up of industry, our responsibilities in the field of industrial hygiene are multiplying. Able-bodied men are being mobilized into the Army, while women, young adults, and older men replace them in their jobs. These new workers make imperative increased provision for industrial hygiene activities. For all workers, new industrial processes create hazards which demand for their solution the skill of the hygienist, the toxicologist, and the industrial engineer. The significance of industrial hygiene programs in industry's expansion for national defense is far beyond what it was in 1917.

Even in more peaceful days, however, we could not claim that we had more than started this work—and here we are in a crisis that affects industry profoundly.

This is peculiarly your responsibility. Aside from those health services that may be part of accident prevention, public responsibility for protecting the health of industrial employees is vested in health departments.

The Public Health Service is throwing all the resources it can behind this work. It has expanded research in this field and directed it upon the new chemicals and mechanical problems of industrial health. A consultant nurse in industrial nursing has been added to the staff of the Division of Industrial Hygiene at the National Institute of Health. It is a pity that industrial nursing has not been given its rightful importance in the various State health departments. We anticipate catching up with this lag, however.

It is not only the occupational hazards with which health departments should concern themselves. Public health programs should provide for the worker at work, at home, and in the community. This complete consideration for the worker's health is in the pursuit of better national health through peaceful years. It is even more necessary as the efforts for defense take on momentum.

Another problem that I would bring forcibly to your attention is the old problem of medical care. What to do for those who need a doctor and have no money? How to provide hospital care for those who lack the financial "open sesame" to these institutions?

You know what is bound to happen as industrial plants expand and hang out the "employment" sign. People trek into town from all directions in search of work. When a village of 1,000 is asked to play host to many thousands, the tax structure cannot be expected to stand up to the situation.

To all defense areas there will come a large group of people who if they do not actually arrive in need will soon fall into need, through no fault of their own. Only a very small fraction of this group comes within the accepted connotation of the term "camp followers." It will include skilled or unskilled workmen, people who plan to invest their savings in small businesses, and others looking for jobs behind a counter, at a cashier's desk, or somewhere in the scheme of a boom in business.

They come and the situation happens to fail them. They do not find the jobs they expected to walk into. The businesses they open fail for some mysterious reason to "click." Or perhaps they do get along and are meeting their needs when illness strikes them or some member of their family. Then they are well into a situation they cannot manage.

We have already seen that the present national emergency is making the distribution of physicians and nurses even more unequal than it has been. Something must be done to counteract the forces doing the unequalizing. The supply of civilian medical and nursing personnel should be maintained and, if possible, increased.

As to the inadequacy of hospital facilities, that is a problem carried over from our peaceful era and due to be aggravated by the circumstances now shaping up, particularly in the defense communities.

Some of these needs we hope can be met by the so-called Community Facilities Bill now before Congress.

Closely allied to our state of health in the past and of vital importance now is the problem of nutrition. I should put this as the third important problem in our health defenses. A program to improve national nutrition would have been a necessity in continuing our quest for the good life. And we shall certainly need our nutrition in the activities that lie ahead.

The President has already called the first national conference on nutrition. When the experience and the ideas of the experts have been pooled at that conference, we can judge better in what direction we should start. At any rate, it is something to lay before this group, because this is the group that will carry much of the responsibility.

You may be assured it is the intention of the Federal Government to put all that it can into the program for health. I am hoping that the Congress will make the necessary increases in current appropriations to enhance Federal participation. Pending legislation such as the Community Facilities Bill, the May Act, and the several acts that contemplate aid to communities for hospital construction, all are of interest and merit your support. And above all it is necessary that the States continue their rightful position as leaders in our joint enterprise.

From the vantage point which I happen to occupy, I have tried to emphasize the spots in the public health scene which I think most need emphasis. The problems of industrial hygiene, of medical and hospital care, and of nutrition seem to me the most immediate. It is a relief under distressing circumstances to have something immediate on which to focus. During the week that you met last year, the Low Countries were invaded, and steadily since then a kind of anarchy has set in such as we had never dreamed of. It would take someone with more faith in his second sight than I have in mine to offer any prediction as to what lies ahead. So I am stopping with our immediate problems, which I think is suitable, for immediate problems are the sort of thing public health should be pursuing up to the very din of Armageddon.

"SPORADIC" POLIOMYELITIS

With Special Reference to the Geographical and Chronological Distribution in Tennessee in the 18 Months Ended June 30, 1940

By L. L. Lumsden, *Acting Director, Division of Preventable Diseases, Tennessee Department of Public Health*

Since the collection of morbidity reports was begun by the Tennessee Department of Public Health in 1925, cases of and deaths from poliomyelitis have been reported every year in Tennessee. In some of the years the number of deaths reported from the disease nearly equalled

and in 1 year (1925) exceeded the number of cases reported. Even though reports of deaths since the end of 1925 from counties with full-time health departments and also those from the other counties since the end of 1937 have been accepted and recorded as reports of cases, the ratio of recorded deaths to recorded cases for the whole period of 15 years suggests that (*a*) the reports of cases were far from complete, (*b*) the deaths in considerable proportion were charged incorrectly to poliomyelitis, or (*c*) the disease was unusually fatal. The records are given in table 1.

For most of these years the morbidity and mortality rates werelow and the cases were widely scattered over the State. In 1936 the situation was unusual. In the summer and autumn of that year the reported incidence was comparatively high and the disease was concentrated in outbreak proportion (over 50 cases per 100,000 population) in an area comprising a single row of counties extending from the south to the north border of the State and being adjacent on the south to the area in the northwest section of Alabama and the northeast section of Mississippi in which poliomyelitis occurred coincidently in outbreak proportion.[1]

TABLE 1.—*Poliomyelitis, reported cases and deaths, with rates per 100,000 population, Tennessee, 1925–39*

Year	Number		Rate [1]		Year	Number		Rate [1]	
	Cases	Deaths	Morbidity	Mortality		Cases	Deaths	Morbidity	Mortality
1925	31	36	1.2	1.4	1933	118	35	4.4	1.3
1926	30	26	1.2	1.0	1934	61	34	2.2	1.2
1927	91	37	3.6	1.5	1935	91	28	3.3	1.0
1928	46	38	1.8	1.5	1936	385	45	13.8	1.6
1929	123	32	4.7	1.2	1937	127	30	4.5	1.1
1930	70	25	2.7	1.0	1938	39	20	1.4	.7
1931	53	24	2.0	.9	1939	34	12	1.2	.4
1932	61	20	2.3	.7					

[1] Based on population estimates made by the Tennessee Department of Public Health.

THE SITUATION IN 1939

Effort was made to obtain certain detailed data on every case reported or recorded as poliomyelitis in Tennessee during the calendar year 1939. Thirty-seven cases were recorded. Of these, 3 originally diagnosed and reported as poliomyelitis were reported after subsequent clinical observations or laboratory findings as cases of other diseases—one as tuberculous meningitis, one as neurasthenia, and one as infantile scurvy—and were removed from the official morbidity records of poliomyelitis. Some of the data collected on the 34 cases remaining on the official records are presented in table 2, the cases being numbered in the order in which detailed data regarding them were obtained.

[1] Lumsden, L. L.: Poliomyelitis, facts and fallacies. South. Med. J., 30: 465–475 (May 1938).

TABLE 2.—*Data on cases officially recorded as poliomyelitis in Tennessee in 1939*

Case No.	Race	Sex	Age, years	Residence (county or city)	Approximate date: Reported	Approximate date: Onset first symptoms	Approximate date: Paralysis	Diagnosis made by—: Family physician only	Diagnosis made by—: Family physician and local health officer	Diagnosis made by—: Hospital staff	After official queries and final observations diagnosis regarded	Death	Remarks
1	W	F	7	Nashville (city)	Jan. 21	Jan. 1	+Jan. 1	+			±		Onset sudden with paralysis of face and one arm and weakness of leg on same side. No systemic symptoms noted. Physician regarded diagnosis doubtful. Residence 2 miles north of capitol in poor neighborhood.
2	W	F	42	Blount	Feb. 11	1897	+1897	+			−	Jan. 3	Case recorded from death certificate giving infantile paralysis as only cause of death. Inquiry showed patient had been paralyzed since infancy and that immediate cause of death was probably myocarditis.
3	C	F	5	Lauderdale	Apr. 8	Mar. 27	±Mar. 30	+			−	Apr. 27	Diagnosis of case made after one brief observation by physician who later signed death certificate giving "lobar pneumonia" only as cause of death.
4	W	M	16	Warren	Apr. 8	(?)	+	+			±		Case reported incidentally in course of efforts to have the boy admitted to a home for crippled children. History indefinite as to time crippling began and nature of preceding illness.
5	W	F	6 months	Campbell	Apr. 17	Mar. 1	(?)	+			−	Mar. 11	Case recorded from death certificate. Reporting physician stated baby had symptoms of gastroenteritis for about 10 days and had "generalized paralysis" for a day or two before death.
6	W	M	11	Knox	May 5	Mar. 25	+Apr. 18	+			±		Reporting physician stated the illness began with upper respiratory infection that developed into a serofibrinous pleurisy. Upon noting paralysis in both legs on Apr. 18 he insisted on spinal puncture and patient was taken out of his hands.

7	C	M	3	Montgomery	May 23	Apr. 10	±Apr. 13		+		±	Apr. 19	Case recorded from death certificate. Patient had high fever and pronounced stupor throughout illness with apparently definite muscular weakness in both arms and legs 2 or 3 days after onset of illness. Neither reporting physician nor health officer made definite diagnosis of case.
8	C	F	12	Cocke	June 27	June 22	+June 23		+		+	June 26	Case seen by health officer and 4 other physicians. All concurred in diagnosis of poliomyelitis with paralysis of Landry's type.
9	C	F	19	Bedford	July 3	June 19	+June 21			+	±	June 24	Patient was admitted to hospital with respiratory paralysis. No satisfactory history of the illness prior to admission was obtainable.
10	W	M	2½	Davidson	July 8	June 26	+July 1			+	+		Home in scattered village, rather poor and insanitary neighborhood in northeast suburb of Nashville. 4 other children in family under 11 years. No other suspected case in home or neighborhood.
11	W	F	19	Chattanooga (city)	July 5	June 3	+June 5			+	+		Case seemed clinically typical. This was the only case reported in Hamilton County in 1939.
12	W	F	7	Knox	July 18	June 16	+June 28	+			+		Case seemed clinically typical. Residence 15 miles northeast of Knoxville in isolated section of county.
13	W	M	16	Unicoi	July 15	June 20	+July 14		+		±	July 17	Case was first diagnosed typhoid fever. Flaccid paralysis of left arm and leg noted 3 weeks later with bronchopneumonia and deep coma developing 3 days before death.
14	C	M	10	Williamson	July 19	June 25	+July 2			+	+		Familial contact with active cases of tuberculosis for 3 years before onset. Boy at beginning of his illness was thought to have tuberculous meningitis but after thorough hospital study his case was positively diagnosed as poliomyelitis. Home insanitary and crowded; located 18 miles southwest of Franklin. No other case found in county during 12 months after this case.
15	W	M	13	Davidson	Aug. 1	July 19	+July 22	+			+		Residence 8 miles south of Nashville in country neighborhood with good sanitary conditions. Boy had brief contact on July 8 and 10 with a man who had been traveling in Charleston County, S. C., during the several months before. 5 days before illness boy went swimming in creek near cattle crossing in northern part of Williamson County.
16	W	M	6 months	Sumner	Aug. 1	Apr. 22	—	+			—		Baby had mild upper respiratory infection with some indication of pain and a slight swelling of forearm. One of the physicians who saw the case thought arm trouble was due to mechanical injury. No spinal fluid or blood examination made. Baby entirely well when examined on July 18
17	W	F	12	Nashville (city)	Aug 7	July 22	+July 28			+	+		R-sidence 3½ miles east of capitol in a rather poor, scattered residential neighborhood. Evidence of abundance of rats in immediate vicinity.

TABLE 2.—*Data on cases officially recorded as poliomyelitis in Tennessee in 1939*—Continued

Case No.	Race	Sex	Age, years	Residence (county or city)	Approximate date: Reported	Approximate date: Onset first symptoms	Approximate date: Paralysis	Diagnosis made by—: Family physician only	Diagnosis made by—: Family physician and local health officer	Diagnosis made by—: Hospital staff	After official queries and final observations diagnosis regarded	Death	Remarks
18	W	F	5	Davidson	Aug 8	July 10	+July 11	+			+		Residence on farm 10 miles east of Nashville. Sanitary conditions rather poor. Various kinds of livestock on premises. A day or two after onset of child's illness a hen on place was found paralyzed in 1 leg and 1 wing. Hen was killed and buried. 3 or 4 of large flock of hens had had a similar affliction during winter and spring before.
19	W	M	4	Giles	Aug. 8	July 23	±July 30		+		±	Aug. 1	Boy had malaise and perhaps slight fever for 2 days beginning July 23 and thereafter seemed entirely well until July 30 when physician saw him. Boy had temperature of 102° and weakness of right leg which was drawn up, and severe pain in appendical region. No examination of spinal fluid or blood. No other suspected case found in Giles County until January 1940.
20	W	M	22	Wilson	Aug. 28	Aug. 8	+Aug. 10			+	+		Residence 8 miles southwest of Lebanon in a remote, rugged, wooded neighborhood. Conditions of premises insanitary. House crowded. Family including 4 small children had no other recent illness. Severa hens on premises had developed a paralytic condition during the summer, 1 of them having become paralyzed in 1 wing and 1 leg on opposite sides about same time as onset of case diagnosed poliomyelitis.
21	W	M	14	Nashville (city)	Aug. 22	Aug. 11	—			+	±		Residence 1½ miles east of capitol in a poor, insanitary neighborhood, rural in character. Boy was ill for only about 1 week with slight fever and general muscular weakness. When examined thoroughly on Sept. 6 he was pale, poorly nourished, with flabby musculature but no evidence of paralysis or localized muscular weakness.

22	W	M	3	do	Aug. 22	July 3	+July 5			+	+		Residence about 4 miles west of capitol in a poor village neighborhood with sanitary conditions generally poor.
23	C	M	3	Sumner	Aug. 29	July 5	±July 8		+		±		The boy had soreness and weakness in legs and back following an attack of stomachache of 2 or 3 days' duration. 21 days after onset of illness he appeared well except for slight weakness in left leg. Encephalomyelitis was suspected but physicians who examined the case thought it more likely poliomyelitis.
24	W	M	1¼	Cocke	Sept. 5	Aug. 12	+Aug. 12		+		+	Aug. 16	Diagnosis supported by autopsy finding of histopathology typical of poliomyelitis of medulla and upper spinal cord. Clinical course was that of bulbar and spinal type of poliomyelitis. 6 in family including 3 other children under 10. All had been under treatment for syphilis since December 1938. Home in isolated rural neighborhood with poor sanitary conditions.
25	W	M	1¼	Wilson	Sept. 5	Aug. 28	±Aug. 30	+			+		Child had measles in June 1939. Sister aged 5 had slight sore throat at the time of onset of this child's illness. Fever continued for about a week and was followed by weakness but not definite paralysis of both legs and back. Residence, excellent country home, 2 miles east of Lebanon. 3 chickens on premises became lame about same time boy became ill. 1 of them demonstrated to have fowl neurolymphomatosis with tumor of sciatic nerve.
26	W	M	19	Robertson	Sept. 2	Aug. 24	±Aug. 31	+			−	Sept. 10	A few days after family physician diagnosed and reported the case as poliomyelitis, patient was admitted to a hospital in Nashville where a definite diagnosis of tuberculous meningitis was made. Death certificate issued by hospital gave tuberculous meningitis as cause of death and miliary tuberculosis as contributory.
27	W	F	4	Hardin	Sept. 11	Aug. 30	±Sept. 4		+		±		No paralysis but definite localized muscular weakness with fever continuous from Aug. 30 to Sept. 22. Systemic symptoms strongly suggestive of poliomyelitis. Residence in isolated rural neighborhood, 20 miles southeast of Savannah. No other cases suspected to be poliomyelitis in county during the year.
28	W	F	5	Sumner	Sept. 12	Aug. 23	+Aug. 29	+			+		Local health officer concurred in diagnosis of clinical poliomyelitis. No examination of spinal fluid or blood. Home in isolated, rural neighborhood 25 miles from Gallatin.
29	W	M	4	Blount	do	Sept. 1	+Sept. 2		+		+		Case clinically poliomyelitis. No examination of spinal fluid or blood made. Home in rural neighborhood 6 miles northeast of Maryville. 9 in family, 5 under 10 years. Living conditions poor. Small unscreened frame dwelling. No other case diagnosed or suspected to be poliomyelitis in county during year except No. 2 in this table.

TABLE 2.—*Data on cases officially recorded as poliomyelitis in Tennessee in 1939*—Continued

Case No.	Race	Sex	Age, years	Residence (county or city)	Approximate date			Diagnosis made by—			After official queries and final observations diagnosis regarded	Death	Remarks
					Reported	Onset first symptoms	Paralysis	Family physician only	Family physician and local health officer	Hospital staff			
30	C	M	10 months	Madison	July 20	Jan. 1	(?)	+			−	Jan. 7	Case recorded from death certificate received in July. Reporting physician saw patient once a few hours before death. No history given to indicate nature of illness prior to that time.
31	W	F	2	Unicoi	Oct. 14	Oct. 10	+Oct. 12		+		+		Clinical signs and symptoms strongly suggestive of poliomyelitis. No examination of spinal fluid or blood made.
32	W	M	10	do	Oct. 23	Oct. 18	+Oct. 19		+		+		Clinical signs and symptoms strongly suggestive of poliomyelitis. No examination of spinal fluid or blood made. This boy played with brother of baby with case No. 31. The 2 homes are in the same immediate vicinity in a suburb of Erwin.
33	C	F	2	Lauderdale	Nov. 18	Nov. 8	+Nov. 16		+		±		Child was not seen by any physician during her systemic illness. History obtained from family was vague and indefinite but not so far as it went suggestive of poliomyelitis. Medical examination in January 1940 found "marked weakness below hips, atrophy of muscles and flaccid paralysis, left leg more marked than right."
34	W	M	1¼	Henry	Dec. 2	do	+Nov. 12	+			+		Symptoms and signs clinically strongly suggestive of poliomyelitis. No examination of spinal fluid or blood made. 3 other children under 10 years of age in family. None of the others had any illness suggesting poliomyelitis.

Three of the 12 deaths charged to poliomyelitis in the mortality records for 1939 are not reflected in the morbidity reports because two of them were of nonresidents admitted to hospitals within the State after development of the illness outside the State and one (occurring in Sevier County in June) was regarded from the data given in the delayed death certificate as not having been caused by a recent attack of poliomyelitis but as having been due essentially to other causes.

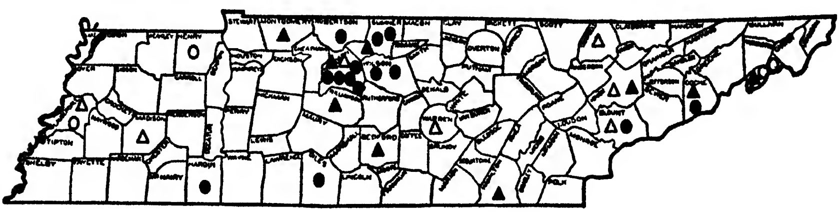
Age, sex, and race distribution.—The distribution by age, sex, and race of the persons affected is shown in the following table:

Age, years	White		Colored		Total
	Male	Female	Male	Female	
Under 5	8	3	3	1	15
5–9	0	4	0	1	5
10–14	4	1	1	1	7
15–19	3	1	0	1	5
20 and over	1	1	0	0	2
Total	16	10	4	4	34

Reporting of cases.—Of the 34 cases, 20 were reported by attending private physicians, 4 by local health officers, 6 by hospital staffs, and 4 not reported as cases were recorded from data given in death certificates. Reports of cases from family physicians or hospital staffs in areas with full-time local health service went to local health departments and thence were transmitted to the State Department of Public Health, while in other areas such reports went direct to the State Department of Public Health. How many cases, if any, with clinical manifestations warranting a diagnosis or at least a suspicion of poliomyelitis occurred and were not reported is a matter of speculation. There is no evidence that the number of such cases was considerable. In the more populous counties with one or more cases reported, intensive observations and inquiries by the local health departments and other agencies continuing for months after the occurrence of each of the reported cases failed to discover any additional case.

Diagnosis.—Since in epidemiological studies data collected on cases reported under erroneous diagnoses are positively misleading, the basis for the diagnosis of each of the cases reported was ascertained to the fullest extent practicable. In 15 of the cases the diagnosis prior to official reporting was made by the family physician only, in 11 by the family physician and the local health officer, and in 8 by a hospital staff. The procedures of the Division of Preventable Diseases in checking on diagnoses included (*a*) querying attending physicians and/or local health officers (in all cases) for details regarding clinical manifestations and laboratory findings, (*b*) visits to the homes

of some (13) of the patients to observe clinical manifestations or to obtain clinical histories and to secure specimens for laboratory examination, and (c) review of laboratory findings in 16 of the cases and of autopsy findings in one. In some instances the local health officer did not concur in the diagnosis made by the attending physician, but in such instances the case remained in the official records as poliomyelitis unless the attending physician saw fit to change the diagnosis and to report the change. From all of the data obtained by the various procedures of investigation, the preponderance of evidence appears to warrant the opinion that of the 34 cases the diagnosis almost certainly was erroneous for 6, more or less doubtful for 11, and correct



LEGEND

△ CASES WITH ONSETS JANUARY 1 TO MARCH 31
▲ " " " APRIL 1 TO JUNE 30
● " " " JULY 1 TO SEPTEMBER 30
○ " " " OCTOBER 1 TO DECEMBER 31

FIGURE 1.—Cases reported and/or recorded as poliomyelitis in Tennessee in 1939, by season of occurrence. Total=34.

(or fully justified by clinical manifestations along with the findings from such laboratory examinations as were made) for 17.

Geographical and chronological distribution.—Figure 1 shows the distribution, by season and by county of residence, of the cases reported in 1939 and retained in the official records of poliomyelitis. The cases were reported from 19 of the 95 counties of the State. Of the counties with reported cases, some are in the westernmost, some in the easternmost, some on the southern border, and some on the northern border of the State, with considerable stretches of country between them as a rule. One of the counties had 7 cases, 2 had 3 cases each, 5 had 2 cases each, and 11 had 1 case each. The nearest approach to concentration was in a group of 3 contiguous counties, Davidson, Sumner, and Wilson, in the north central part of the State. In this area, however, the incidence was only 1 case to about 24,000 population. Of the 7 cases in Davidson County, 4 were in the city of Nashville and 3 were in widely separated rural areas of the county in 3 different directions from the city. The residences at which the 4 cases in Nashville occurred were in 4 different suburbs of the city, no two being within 2 miles of each other. The approximate dates of

onset of the cases in these 3 counties were as follows: In Davidson, January 1, June 26, July 3, 10, 19, and 22, and August 11; in Sumner, April 22, July 5, and August 23; in Wilson, August 8 and 28. The cases in Sumner County were in 3 different neighborhoods. The 2 cases in Wilson County were in homes about 10 miles apart in open country neighborhoods, one 2 miles east and one 8 miles west of the city of Lebanon. In the other counties with 2 or more cases the onsets were, in Lauderdale, March 27 and November 8; in Knox, March 25 and June 16; in Cocke, June 22 and August 12; in Unicoi, June 20 and October 10 and 18.

In the affected areas of the State generally no evidence whatsoever was found of a causal connection between cases or of a common source of infection. The only exception to this rule was in Unicoi County where two cases with onsets 8 days apart (in October) developed in two closely associated families living in the same suburban section of the town of Erwin. The district health officer in reporting on October 23, 1939, the second of these two cases stated "This may be the onset of an epidemic." However, no additional case either diagnosed or suspected was found in Unicoi County and reported in the following 9 months.

It is interesting to note that in most instances in which two or more cases occurred in a county or a general vicinity the interval between the onset of the first case and that of the second was over 6 weeks. The interval between the onsets of the two cases in Cocke County, both with clinical manifestations thoroughly warranting the diagnosis and one of them with supporting evidence furnished by autopsy findings, was from June 22 to August 12.

The majority of the cases occurred in open country homes where generally conditions were insanitary with respect to water supplies, excreta disposal, and exposure to insects, and where poultry and other domestic animals were kept on the immediate or nearby premises.

In the 6 largest urban centers, Jackson, Johnson City, Knoxville, Chattanooga, Nashville, and Memphis, with populations ranging from about 22,000 to 255,000 and aggregating about 680,000, only 5 of the reported cases presumably of local origin occurred—4 in Nashville and 1 in Chattanooga. Thus, the incidence in the main urban areas of the State was only 1 case to about 136,000 population.

Deaths.—Of the 34 persons having illnesses recorded as poliomyelitis, 11 died within a few weeks after the onset of the illness. The causes of death as given in the death certificates were poliomyelitis or infantile paralysis for 9, lobar pneumonia for 1, and tuberculous meningitis for 1. Of the 8 cases recorded in the first 6 months of the year, 5 died.

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THE SITUATION FROM JANUARY 1 TO JUNE 30, 1940 [1]

In this period 8 cases were reported as poliomyelitis, 1 in Giles County and 1 in Obion County for the week ended February 17, 1 in Hardin County for the week ended April 6, 1 in Trousdale County for the week ended April 13, and 4 in Shelby County, 3 for the week ended June 8 and 1 for the week ended June 15. Thus the incidence of reported cases in this period was diffused in widely separated areas in the middle and western sections of the State.

Information obtained subsequent to the receipt of the first reports of the cases was (1) that the Hardin County case was found by autopsy to be a case of malignant medulloblastoma in the cervical portion of the spinal cord, (2) that the Trousdale County case was "chronic," and (3) that 3 of the Shelby County cases had been reported through clerical error in the course of a tabulation of old records of crippled children. Of the 3 cases with clinical manifestations and courses appearing to warrant the diagnoses and which are retained in the official morbidity records of poliomyelitis for the first 6 months of 1940, 1 developed in an isolated country home in Giles County about December 28, 1939, 1 in an isolated country home in Obion County about January 28, 1940, and 1 in a village home in Shelby County about May 4, 1940.

DISCUSSION

The data collected in the course of this study are obviously fragmentary, but they are sufficient to indicate some of the features of what appears to be a fairly typical poliomyelitis situation with a low rate of incidence widely and irregularly distributed over a large area. Erroneous or highly questionable diagnosis in a considerable proportion (over 30 percent) of the cases was a conspicuous feature. The meagerness of evidence of either direct or indirect connection between the cases was another.

[1] Since this report was written, studies have been made of the 45 cases reported as poliomyelitis in Tennessee for the period July 1 to December 31, 1940, and retained on the morbidity records. These cases occurred in 19 counties, all of which, except Shelby with 2 cases and Fayette with 1, are in the northern half of the State. Five or more were reported in each of 3 counties, 2 in each of 5 counties, and 1 in each of 11 counties. There was a concentration in the eastern end of the State with 12 cases in Johnson County, 7 in Greene, and 5 in Washington. In the 6 Tennessee counties adjacent to 1 or the other of these 3 counties, there was a total of only 4 reported cases. In 6 of the cases reported in Greene and Washington Counties the diagnosis appeared doubtful.

The situation in Johnson County was the nearest approach to an outbreak in Tennessee since 1936. Ten of the 12 cases were in the open country, in quite isolated homes scattered in a rugged valley area about 20 miles in length north and south, and averaging about 2 or 3 miles in width with Mountain City near its center. It is estimated that this area, exclusive of Mountain City, has a population of about 1,200. In Mountain City, with a population of about 1,100, not a case was reported. The clinical diagnosis in each of these 10 cases appeared thoroughly warranted. Not more than one case developed in any of the homes. Of the affected homes, 6 are from 1 to 10 miles south, and 4 from 1 to 8 miles north of Mountain City. Not a trace of evidence was found by searching inquiry of direct or indirect personal contact between any two of the affected families. Of the cases, 6 had onset of illness between July 28 and August 20, 1 on September 1, and 3 between October 6 and October 24.

The distribution in its diffusion and unpredictability seemed somewhat comparable even to that of lightning stroke. While a few "sporadic" cases were occurring in widely separated places in Tennessee, outbreaks of high intensity were occurring in Charleston County and Floyd County in the neighboring States of South Carolina and Kentucky, respectively.[3] The differences in epidemiological behavior of the disease or the diseases called poliomyelitis in different neighboring areas in the same period of time or in the same area in different periods of time gives cause for questioning a causal identity. If one specific virus is an etiological constant in all of the epidemiological varieties other causative factors must operate variably.

The distribution of the cases officially recorded as poliomyelitis in Tennessee during the period from January 1, 1939, to June 30, 1940, is not satisfactorily explicable on an epidemiological basis of practical

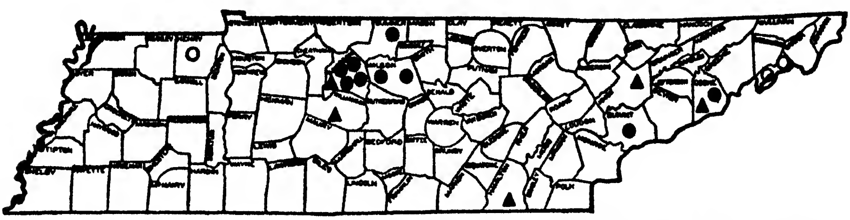

FIGURE 2.—Reported cases of poliomyelitis in Tennessee in 1939 (by seasons, as indicated in figure 1) in which the diagnoses appeared well established by all of the clinical manifestations. Total=17.

probability. If the cases in which the diagnoses seem definitely erroneous or doubtful are eliminated from the picture the problem is not lessened essentially (see fig. 2). The findings appear to eliminate beyond reasonable doubt direct personal contact between cases with pathognomonic or suggestive symptoms as a considerable factor but they do not eliminate the possibility either of spread of infection by human carriers or of infection harbored by lower animals and conveyed from them to persons through insect transmission or otherwise. If the disease was caused by infection spread entirely or largely in the nasopharyngeal secretions or alvine discharges of human carriers, the carriers, whether few or many, must have had a wide range of distribution over the State from time to time during the 18 months, disseminating the infection either to only a few persons in widely separated places or to many persons in large populous communities among whom there happened to be at the time a very small proportion susceptible to the manifest disease. It is also apparent that if the disease was caused by infection harbored by lower animals and transmitted from them to persons by biting or stinging insects the reservoirs and the vectors must have had a wide and spotty range of effective operation.

[3] Dauer, C. C.: Prevalence of poliomyelitis in the United States in 1939. Pub. Health Rep., 55: 955–961 (1940).

It is interesting in puzzling over the problem of poliomyelitis distribution to consider the elements of mystery in the distributions of other diseases for which scientific knowledge regarding the causation or mode of spread is generally regarded as well established.

Even smallpox, a classical example of the diseases classified as contagious, presents at times epidemiological manifestations suggesting the operation of some unknown factor or factors in its causation or spread. Tennessee furnished such an instance in 1939. The distribution of the total of 283 reported cases was confined to 16 counties which are scattered in different regions of the State, In only 6 counties were more than 5 cases reported—10 in Warren, 12 in Gibson, 15 in Crockett, 23 in Van Buren, 25 in Madison, and 179 in White. The limited distribution did not appear to be due entirely to control measures because in some of the areas with a few cases a large proportion of the population remained unvaccinated and the control measures (such as isolation of patients and vaccination of immediate contacts) were not applied early enough or on a sufficient scale to have much effect. The high incidence in White County was concentrated in and within a radius of about a mile of the county-seat town of Sparta and was largely confined to that area. Scattered cases had occurred in the county during the several months preceding the outbreak in May. Less than 10 percent of the county's population had ever been vaccinated before the outbreak. Effective control measures were not inaugurated before the outbreak had passed its height as measured by the probable dates of infection of the cases. Why the outbreak did not occur earlier in the year and why the disease did not spread in outbreak proportion throughout the county and the neighboring counties whose populations also were very largely unprotected by vaccination cannot be explained satisfactorily with our present knowledge of smallpox.

The markedly higher morbidity and mortality from diphtheria among children under 5 years of age in the east Tennessee counties than among those in the middle and west Tennessee counties [4] cannot be explained satisfactorily by difference in extent, degree, and kind of artificial immunization, and of other public health procedures and seems to be due to the operation of some factor or factors not yet determined.

Figures 3, 4, 5, and 6 show the distribution of reported cases of Rocky Mountain spotted fever, tularemia, meningococcus meningitis, and tetanus, respectively, in Tennessee in 1939. There is, of course, no known reason to suspect a causal relationship between or a specific etiologic factor common to any of these diseases and poliomyelitis. Yet if allowance is made for the difference in numbers of cases, the distributions show some interesting general similarities. The scattered

[4] Sanford, W. V., Puffer, Ruth R., Tucker, C. B., and Hardison, A. E.: Diphtheria in Tennessee. South. Med. J., 33: 321-327 (March 1940).

distribution of the Rocky Mountain spotted fever cases is strikingly similar to that of poliomyelitis. The same would hold for tularemia if the cases were eliminated which occurred among market workers and other persons in urban centers who contracted the infection from rabbits transported after death from their native habitats. The

FIGURE 3.—Reported cases of Rocky Mountain spotted fever (eastern type) in Tennessee in 1939. Total=23

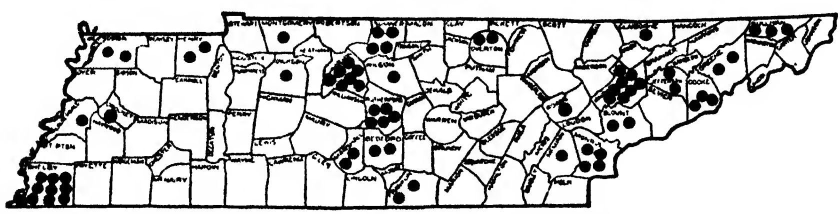

FIGURE 4.—Reported cases of tularemia in Tennessee in 1939. Total=70.

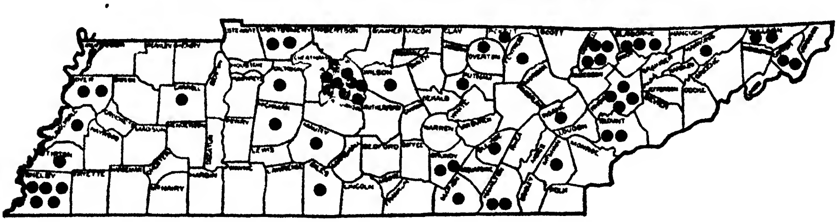

FIGURE 5.—Reported cases of meningococcus meningitis in Tennessee in 1939. Total=56.

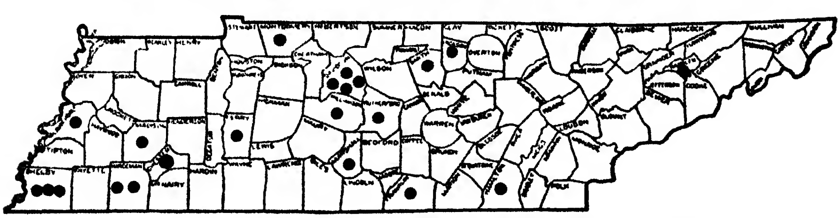

FIGURE 6.—Reported cases of tetanus in Tennessee in 1939. Total=22.

meningitis cases show a somewhat contrasting tendency to concentration in the urban regions. The distribution of the tetanus cases, if taken alone, would appear to suggest about as much as does that of poliomyelitis a spread of the infection by personal contact.

This comparison of distributions of different unrelated diseases is made to indicate the importance of thorough open-mindedness in epidemiological studies of the unsolved problem of poliomyelitis

causation. In the recent study of the problem in Tennessee consideration was given constantly to contagion, to animal harborage and insect transmission, and to every other conceivable source-spread possibility. Every trail even remotely suggestive was pursued but none led far enough to be impressive.

One of the trails which was of special interest for a while was found in the course of consecutive visits to three affected homes, one in the southeastern part of Davidson County and two in Wilson County. At each of these homes at about the same time as the development of the poliomyelitis case some (about 2 percent) of the chickens on the premises had manifested a paralytic condition involving legs or wings, or both. In some cases a leg and a wing on opposite sides, in others a leg and wing on the same side, and in others both legs were affected. A number of homes in each of the affected neighborhoods in Wilson County were canvassed but at none of them except those with the cases of poliomyelitis was evidence obtained of recent occurrence of paralysis among the chickens on the immediate or nearby premises. From one of the affected homes in Wilson County a half-grown chicken recently recovered from the paralysis and a hen with definite paralysis of a few days duration of one leg and the opposite wing were taken to the Division of Pathology of Vanderbilt University for examination. The findings in the chicken were negative. Those in the hen showed pathological manifestations of neurolymphomatosis including a tumor the size of a small pea involving the sciatic nerve of the affected leg. In obtaining data on poliomyelitis cases investigated subsequent to the observations at these three homes specific inquiry was made but in no other instance was evidence obtained of concurrent fowl paralysis and human poliomyelitis at the same home. Thus the chicken paralysis trail did not lead far, but it did lead as far as any other epidemiological trail found in the course of this study.

No two of the cases occurred in the same household. In no instance was there even a suggestion of direct conveyance of the infection from the sick to the well. In only two instances was there any concrete evidence found suggesting the possibility of conveyance of the infection by carriers. In one of these, in Unicoi County in October 1939, two children in different families living in the same immediate vicinity had onsets of illness 8 days apart and in this interval the second child to be affected had played with a well child of the first family, but away from the home of the child first stricken. It appears that in this instance the possibility of a common source of the infection cannot be eliminated. The other instance was in Davidson County in July 1939. A child in a family living in a home with good hygienic conditions became ill 11 days after a social visit of a few hours to the home by a man who during the several weeks before had been traveling on business in the vicinity of Charleston, S. C., where poliomyelitis

then was prevalent. The visitor had had no recent indication of illness.

The evidence obtained by this study is mainly negative; but, as such negative evidence has a value in epidemiology, it may be useful for consideration in future studies. In the face of all of the evidence yet obtained a question might be raised as to whether there has been in Tennessee since 1936 a single case of poliomyelitis etiologically identical with that which occurs at times in the United States in outbreak or epidemic form. Even in the Cocke County case in which the clinical diagnosis was supported by autopsy findings no determination was made of the nature of whatever virus, if any, was in the pathological picture.

CONCLUSION

Intensive and extensive systematic studies of "sporadic" poliomyelitis situations as well as of localized outbreaks and of widespread epidemics of the disease would be of epidemiological value and a definite program of such studies should be formulated and carried out by State, Federal, and other centralized public health agencies. Such studies would be likely to reveal a considerable proportion of erroneous diagnoses, especially in nonepidemic seasons.

A CLINICAL STUDY OF POLIOMYELITIS IN CHARLESTON COUNTY, SOUTH CAROLINA, 1939 [1]

By Dorland J. Davis, *Assistant Surgeon*, Francis J. Weber, *Assistant Surgeon, United States Public Health Service*, and Margaret S. Arey, R. N., *Orthopedic Consultant Nurse, County Department of Health, Charleston, S. C.*

During the year 1939, an unusually large number of cases of poliomyelitis was reported to the State Board of Health of South Carolina. The disease was prevalent throughout the State and was of epidemic proportions in Charleston County, which had an attack rate of 130 paralytic cases per 100,000 population compared with a rate of about 15 per 100,000 for the remainder of the State. While the other county rates varied considerably, no county had a rate approaching that of Charleston, and the disease was not unusually prevalent in surrounding States. A more strictly epidemiological description of the epidemic in South Carolina and in Charleston County will be the subject of another report.

The purpose of this study is to describe the clinical characteristics of the acute disease as it appeared in Charleston County [2] and to

[1] From the Division of Infectious Diseases, National Institute of Health, and the Charleston County Department of Health, Charleston, S. C.

[2] Charleston County has an area of 928 square miles of which 43 square miles are coastal marshland. The provisional figures of the 1940 Census list the county as having a population of 121,006, of whom 70,689 (58.4 percent) live in the city of Charleston.

present a summary of the convalescent progress from an orthopedic standpoint of all persons known to be affected by the disease at least 1 year after the onset of illness. The availability of trained personnel and adequate facilities for orthopedic care, which were organized in Charleston County to meet the epidemic need, afforded an unusual opportunity to make such a study.

Poliomyelitis has occurred sporadically in the district previously, but the epidemic of 1939 was the largest ever recorded in this area. A total of 196 cases, 159 paralytic and 37 nonparalytic, was reported to the Charleston County Department of Health as having had onset between October 1938 and December 1939. The first case occurred in the city of Charleston on October 29, 1938, and others appeared occasionally until April 1939, when there was a decided increase in incidence throughout the entire county. The first week of May marked the peak of the epidemic. Subsequently, the number of cases per week decreased rather slowly, and the outbreak had definitely ceased by September 20, only 4 sporadic cases occurring during the remainder of the year.

The distribution of the paralytic and nonparalytic cases by color and age is shown in table 1. Seventy-two percent of the paralytic patients were under 5 years of age, and there was approximately the same proportion in that age group in both races.

TABLE 1.—*Poliomyelitis in Charleston County, S. C., October 1938 to December 1939, by age and race for paralytic and nonparalytic cases*

Age group, in years	Paralytic			Nonparalytic		
	White	Colored	Total	White	Colored	Total
0–1	5	15	20	1	3	4
1–2	14	23	37	0	4	4
2–3	6	18	24	1	0	1
3–4	10	7	17	4	0	4
4–5	5	11	16	3	1	4
Under 5	40	74	114	9	8	17
5–9	17	17	34	10	3	13
10–14	2	4	6	5	0	5
15–19	3	0	3	0	0	0
20 and over	1	1	2	2	0	2
All ages	63	96	159	26	11	37

Because of the concerted effort of the local health authorities, there is good reason to believe that eventually very few paralytic cases were not reported. Even with the intensive effort to locate and report every illness caused by the disease, however, many paralytic cases were not discovered until some months after onset and two not until a year afterward. Table 2 shows the number of cases reported according to the interval from time of onset of systemic symptoms until the report was received at the county department of health. It is noted that two-thirds of the paralytic cases were reported within

the first week of illness and that reporting was more prompt in the city of Charleston than in the rural districts.

TABLE 2.—*Interval between onset and report of cases*

Interval in weeks	Paralytic				Nonparalytic			
	City		County		City		County	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Less than 1	57	67.0	45	66.1	19	82.6	10	83.4
1-2	19	22.3	12	17.6	4	17.4	1	8.3
2-3	5	5.9	0	0	0	0	1	8.3
3-4	1	1.2	0	0	0	0	0	0
More than 4	3	3.6	[1] 11	16.3	0	0	0	0
Total	85	100.0	68	100.0	23	100.0	12	100.0
Unknown	1		5		1		1	

[1] 2 cases reported 1 year or longer after onset.

While it is believed that nearly all paralytic cases were found, there is no means of determining or estimating the number of nonparalytic cases. It seems certain, however, that the number reported forms only a small part of those which actually occurred. This impression is substantiated by the fact that there was a higher proportion of nonparalytic cases (35 percent) in the group of patients classified by the investigators as of good economic status than among those considered as of fair or poor economic condition (13.4 percent). Undoubtedly, this is a reflection of the greater acuity of diagnosis in the group better situated economically rather than any difference in type of case. If the same ratio of nonparalytic to paralytic cases obtained in the poorer economic group as existed in the better group, the expected number of nonparalytic cases would be three to four times as many as were actually reported. In general, the physicians concerned with the care of patients did not diagnose nonparalytic poliomyelitis unless both the spinal fluid findings and symptoms were characteristic of the disease or unless the suspected illness occurred in a family where a paralytic case had been discovered previously. It is highly probable that many illnesses existed that were, in fact, caused by the virus of poliomyelitis, but which were not brought to the attention of a physician, or, if they were, in which the evidence was not considered sufficient to diagnose the case accurately as poliomyelitis.

Hospital facilities for the patients were adequate and the hospitalized cases were treated in the contagious wards of Roper Hospital. These wards were expanded and additional beds for indigent patients were made available with funds from outside sources, largely from the Children's Bureau of the United States Department of Labor and the National Foundation for Infantile Paralysis; these funds were supervised by the Division of Crippled Children of the State Board of

Health. Of the 185 patients for whom information concerning hospitalization is available, 160, or 86.5 percent, received hospital care during the acute stage of the illness.

CLINICAL DESCRIPTION OF THE CASES

Most of the clinical data concerning the acute phase of the disease were obtained by two of us (D. J. D. and F. J. W.) through personal interview with the patients or their parents. In the majority of instances this information was obtained shortly after the onset of illness and rarely longer than 2 months after onset. Records of spinal fluid examination and further progress of the illness were obtained from Roper Hospital records for both in-patients and out-patients.

It was not possible to secure for all cases complete and accurate clinical information dealing with the acute stage of illness. At the time of interview each investigator recorded his impression of the reliability of the data given by the informant. For this study only those cases have been selected for which it is believed that the data secured are reliable, though not necessarily complete for all items. The group selected comprises 57 paralytic patients, of whom 44 were white and 13 colored, and 18 nonparalytic, all white except one. Thirty-three of the paralytic patients and 9 of the nonparalytic ones were under 5 years of age.

Table 3 shows the percentage of patients who at any time during their acute illness experienced the various symptoms listed. The percentage calculations are based on data indicating either the presence or absence of a symptom, and in an instance where this was uncertain or unknown the case was excluded from the calculation for that specific item. Biphasic type refers to an initial onset with febrile symptoms lasting about 48 hours, followed by a day or so of apparently normal temperature, then a recrudescence of fever and acute symptoms.

Symptoms referable to the nervous system were numerous and the commonest were headache, stiff neck, restlessness, and drowsiness. Gastro-intestinal disturbance occurred very frequently, and vomiting, anorexia, nausea, and constipation were most common. There was little difference between the paralytic and nonparalytic cases except that tremors and muscle twitching were absent in the nonparalytic group.

An analysis of the data was made in an attempt to determine whether or not there was a difference in frequency of symptoms between patients under 5 years of age and those older. The symptoms of headache, dizziness, anesthesia, paresthesia, disturbance of the sensorium, tremor, and muscle twitching were recorded more frequently in the older group, while coryza, cough, and diarrhea were noted more frequently in the younger group.

TABLE 3.—*Occurrence of symptoms and signs in 75 selected cases of poliomyelitis*

Symptom or sign	Paralytic cases			Nonparalytic cases		
	Number of cases	Number having symptoms	Percent	Number of cases	Number having symptoms	Percent
Fever:						
Biphasic type	57	16	28.0	18	4	22.2
Temperature 101° F. or over for 5 days or more	56	14	25.0	18	3	16.7
Respiratory system:						
Sore throat	52	14	27.0	15	5	33.3
Coryza	57	11	19.2	18	1	5.5
Cough	57	9	15.8	18	1	5.5
Gastro-intestinal system:						
Vomiting	57	36	63.0	18	9	50.0
Anorexia	56	33	59.0	18	10	55.5
Nausea	57	31	54.5	18	11	61.0
Constipation	56	25	44.5	17	5	29.5
Abdominal pain	[1] (57)	7	[1](12.2)	[1](18)	0	[1](0.0)
Diarrhea	57	5	8.8	18	1	5.5
Nervous system:						
Headache	49	35	71.4	18	12	66.7
Stiff neck	54	38	70.0	18	14	78.0
Restlessness	56	39	70.0	17	7	41.1
Drowsiness	57	40	70.0	18	8	44.5
Irritability	55	35	63.5	18	6	33.3
Stiff back	51	26	51.0	18	9	50.0
Tenderness at site of paralysis	53	29	54.7			
Tenderness at other sites	51	2	3.9	18	2	11.1
Pain at site of paralysis	53	26	49.0			
Pain at other sites	54	7	13.0	18	9	50.0
Muscle twitching	53	10	18.8	18	0	0.0
Dizziness	51	7	13.7	17	1	5.9
Tremors	55	7	12.7	16	0	0.0
Sensorium disturbances	45	5	11.1	15	0	0.0
Paresthesia	44	3	6.8	15	1	6.7
Anesthesia	46	2	4.3	17	0	0.0
Diplopia	54	1	1.8	17	0	0.0
Photophobia	[1](57)	1	[1](1.7)	[1](18)	2	[1](11.1)
Other symptoms:						
Sweating	55	19	34.5	18	3	16.7
Anuria	56	9	16.0	18	1	5.5
Chills	57	8	14.0	18	1	5.5

[1] Numbers in parentheses indicate that negative data were not recorded on original records; for the other items the negative information as well as positive was recorded in response to a definite question.

In patients having a biphasic temperature curve, muscle paralysis first appeared from the fourth to the fourteenth day of illness, and the median elapsed time between onset and evidence of paralysis was 7 days. In patients not exhibiting the biphasic temperature curve, characteristic paralysis occurred from the second to the twelfth day, and the median onset of paralysis was 4 days after the initial symptoms.

In addition to the signs and symptoms listed in the table for the 75 selected cases, other symptoms were occasionally noted during the acute stage of the illness in some of the 196 reported cases. There is a record of epistaxis in 3 cases; convulsions in 2 nonparalytic cases; and inability to see for several days, marked salivation, and slight ataxia in 1 case each. Two patients showed definite spasticity of both lower extremities, and in one of them the condition lasted for 2 weeks.

One case was of considerable interest because of the infrequent occurrence of this type. A 1-year-old colored male had a typical

attack with definite paralysis of one arm and one leg. The spinal fluid, examined on the day after paralysis developed, showed only 4 cells per cubic millimeter. Recovery from this attack was as complete as it is possible to determine in a child of this age, and he was discharged 3 weeks after onset. Fifty-eight days later there was a recurrence of systemic symptoms, followed by severe paralysis of all extremities. In October 1940, this paralysis was classified as severe in all extremities.

Another case in many respects resembled the adult cases described as occurring in the Los Angeles County Hospital epidemic in 1934 (*1*). The patient, the daughter of a physician, was 21 years old. The onset of her illness was very gradual and insidious, beginning with a severe headache lasting for a week and followed by nausea and vomiting and severe abdominal pain and tenderness. Elevation of temperature was present for only a few hours on the fourteenth day of illness. Muscular weakness started on the eleventh day, at which time it was general rather than localized, and then became gradually more severe until the twenty-second day when both legs and one arm were involved in localized paralysis. Muscle tenderness and pain were unusually severe and lasted for 5 weeks. Recovery was slow and residual paralysis is still present.

Data concerning the results of spinal fluid examinations made in the hospital were available for 123 paralytic and for 34 nonparalytic cases. The spinal fluid was considered abnormal if the cell count was increased above 10 cells per cubic millimeter, or if globulin was present. In most instances both conditions were present. Of the paralytic cases, 115 (93.5 percent) were abnormal at the time of examination. In the nonparalytic group, 29, or 85 percent, were abnormal. Examination of the spinal fluids showing normal findings were all made within 10 days of onset of illness, and 6 of the 13 were withdrawn and examined twice. This experience is similar to that of others who have found cases of poliomyelitis with a normal spinal fluid (*2*).

Of the 196 persons in Charleston County who were known to have had the disease during the period of this epidemic, 37, or 18.8 percent of the cases were nonparalytic, and 16 patients died during the year following onset. Since the proportion of nonparalytic cases varies from epidemic to epidemic, depending certainly on the criteria of diagnosis and possibly on other factors, it is useful to consider the case fatality rate only on the basis of paralytic cases. In this series, omitting 2 deaths which were due to causes other than poliomyelitis, there were 14 deaths among 159 paralytic cases, or a fatality rate of 8.8 percent.[3]

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[3] Material from 2 of the typical fatal cases, inoculated into monkeys by Dr. Charles Armstrong of the National Institute of Health, produced clinical symptoms and pathological lesions typical of experimental poliomyelitis.

Table 4 shows the distribution of the cases by sex and race and fatality rates by location of paralysis. Included in the classification as spinal paralysis are patients who had muscle weakness indicating that only the spinal nerves were affected. The craniospinal group had both cranial and spinal nerves involved, and the cranial group had only cranial nerves affected. The table is constructed to show the significant difference[4] in the distribution of the types of paralysis between the sexes. In this experience males were evidently more than twice as prone to have involvement of cranial nerves as were females. This difference also occurs in the fatality rate, the rate of death for males being nearly three times as great as for females. The craniospinal group, which included the cases of respiratory paralysis, had the highest fatality rate, 53 percent and 50 percent for males and females, respectively. Twelve of the 14 deaths occurred between the fourth and nineteenth days of illness, the other 2 occurred 3 and 7 months after onset, respectively. White females had the fewest cases of cranial paralysis, with only 2 of 28 cases being so affected.

TABLE 4.—*Distribution of reported cases by sex, race, and location of paralysis*

	Male								Female							
	White		Colored		Total				White		Colored		Total			
	Cases	Deaths	Cases	Deaths	Cases	Percent of cases	Deaths	Fatality rate	Cases	Deaths	Cases	Deaths	Cases	Percent of cases	Deaths	Fatality rate
Paralytic:																
Spinal	24	0	35	0	59	72 0	0	0.0	26	0	42	0	68	88.3	0	0.0
Craniospinal	9	5	8	4	17	20.7	9	53.0	1	0	5	3	6	7.8	3	50.0
Cranial	2	0	4	1	6	7.3	1	16.6	1	0	2	1	3	3.9	1	33.3
Total	35	5	47	5	82	100.0	10	12 2	28	0	49	4	77	100.0	4	5.2
Nonparalytic	15	0	8	0	23	[1] 0.28:1	0	0.0	11	0	3	0	14	[1] 0.18:1	0	0.0

[1] Ratio of nonparalytic to paralytic cases.

Although the data for the two races are not summarized, examination of the table will show that there is no difference in the distribution of types of paralysis between the white and colored patients, and consequently no significant differences in the case fatality rates. A much higher proportion of nonparalytic cases was found among white patients than among colored, probably owing to the fact that Negroes are more reluctant to seek medical aid except for severe illnesses. Using the provisional 1940 Census figures for the total population, and the distribution of the population between white and colored of the 1930 Census, which is believed to be not far different from that in 1940, the incidence of paralytic cases was 114 per 100,000 for the white, and 147

[4] Difference in percentage of spinal type is 2.5 times the standard deviation of the difference.

for the colored. This indicates that the colored race is probably at least as susceptible as the white.

CONVALESCENT PROGRESS

It was believed valuable to attempt a summary of the physical condition of all patients at least 1 year after onset of the disease in an effort to get a general view of the more permanent effects of an epidemic of poliomyelitis of this intensity upon a community. Most follow-up studies deal only with special classes of patients, but this experience afforded an opportunity to follow all cases known to have occurred in a population unit of over 100,000 persons during a severe epidemic.

Records were available for every case occurring in Charleston County from October 1938 to December 1939, and in October of 1940 they were reviewed in order to ascertain the orthopedic condition of each patient. With only two exceptions, all cases were of at least 1 year's duration, and since the epidemic occurred in the late spring and early summer of 1939, the vast majority of cases had had their onset 12 to 18 months before this review.

Forty-four cases were or had been under the care of a private physician and 152 were clinic patients. One of us (M. S. A.) regularly visited all the clinic patients in their homes and arranged to have them examined at intervals at the orthopedic out-patient clinic of Roper Hospital by Dr. F. A. Hoshall, the State orthopedic consultant. The Division of Crippled Children of the State Board of Health had supplied necessary apparatus with the aid of funds from the National Foundation for Infantile Paralysis and from the Children's Bureau of the United States Department of Labor. A description of the provisions for nursing and orthopedic care both during and after the epidemic may be found in previous publications (*3*, *4*).

In table 5 the paralytic cases have been classified in six different groups according to degree of involvement as of October 1940. The first group includes patients who had had definite localized muscular weakness or paralysis at some time during their illness, but who had recovered by October 1940. Group II comprises patients who still exhibited slight muscle weakness, but whose disability did not limit their activity to any extent. The third group includes those who had a definite residual paralysis at the time of review, but whose prognosis was considered to be good if proper orthopedic care was continued. These were cases either still showing rapid improvement or whose disability could be corrected by surgical means, that is, tendon transplants or bone blocks. It was believed that with continued proper treatment they would have nearly unlimited activity. Group IV includes cases having a definite residual paralysis which

does not lend itself to correction, and while not incapacitating the patient entirely, does limit him markedly in his activity. Nearly all of this group require apparatus or support of some variety. Group V comprises those patients who are completely incapacitated, usually with all extremities involved. All patients who died are included in group VI. Two of these died during the year of causes other than poliomyelitis, and the state of residual paralysis was unknown at time of death.

Table 5 shows the percentage of the total of 159 paralytic cases in each of these defined groups for all ages and for the age periods under 5 years, 5 to 9 years, and 10 years and over. The cumulative percentages for each group and the groups less severely affected are calculated similarly. It is evident that 57.3 percent of the total paralytic cases fall into group III or one of the less severely affected groups. This proportion of cases thus has, or is expected to have, nearly unlimited physical activity. A further group, comprising 27 percent of the total, has limited activity but is not incapacitated. This leaves 25 cases, or 15.7 percent of the total, who were either incapacitated by the disease or are dead.

TABLE 5.—*Classification of all cases by degree of paralysis in October 1940*

	Under 5 years			5-9 years			10 years or over			Total		
	Number	Percent	Cumulative percent	Number	Percent	Cumulative percent	Number	Percent	Cumulative percent	Number	Percent	Cumulative percent
Group I: No residual paralysis	37	32.4	32.4	14	41.2	41.2	2	18.2	18.2	53	33.3	33.3
Group II: Slight residual paralysis	9	7.9	40.3	5	14.7	55.9	1	9.1	27.3	15	9.5	42.8
Group III: Eventually slight residual paralysis by operation or continued treatment	17	14.9	55.2	4	11.8	67.7	2	18.2	45.5	23	14.5	57.3
Group IV: Definite residual paralysis	33	29.0	84.2	8	23.5	91.2	2	18.2	63.7	43	27.0	84.3
Group V: Incapacitated	8	7.0	91.2	0	0	91.2	1	9.1	72.8	9	5.7	90.0
Group VI: Died	[1] 10	8.8	100.0	3	8.8	100.0	3	27.2	100.0	[1] 16	10.0	100.0
Total	114	100.0	-----	34	100.0	-----	11	100.0	-----	159	100.0	-----

[1] 2 deaths, 4 months and 9 months, after onset of poliomyelitis due to syphilis and "meningitis," respectively. Residual paralysis unknown at time of death.

The evidence at hand does not indicate that there is any difference in the outcome among the various age groups. This includes a consideration of patients under 2 years of age, as well as the groups shown in the table.

Table 5 shows the outcome of the paralytic cases only. If the 37 nonparalytic cases are included in the summary, then 128, or 65.2

percent, of the 196 known cases have, or are expected to have, unlimited activity and will not be handicapped by the disease.

These data are of economic and sociological importance. In this experience, 57.3 percent of all paralytic cases will probably not be seriously handicapped in their ability to earn a living, while those with a permanent residual paralysis (27 percent) will probably be able to earn their living in only a restricted number of ways. Those totally incapacitated, a relatively small group comprising 5.7 percent of all paralytic cases, will always be dependent, and 10 percent of the total have died.

In an effort to ascertain whether there was any change in the severity of the disease, as measured by the residual paralysis, with the seasonal progress of the epidemic, the first third of the cases to occur were compared with the second and last third of the total number of cases. There was no difference either in the distribution of severity of residual paralysis or in the case fatality rate between the cases having their onsets at different periods of the epidemic. This is similar to the findings of Henningsen and Rasch (5).

SUMMARY

Cases of poliomyelitis occurring in the Charleston County, South Carolina, epidemic during the late spring and early summer of 1939 were found to be similar in clinical characteristics to cases of the disease in other parts of the country. In this experience males were apparently more prone to have cranial nerve involvement than were females, and had a higher fatality rate. The colored race appeared to be at least as susceptible as the white to the disease itself, and a similar percentage of fatalities occurred. A review of the convalescent progress of all known cases in Charleston County a year or more after onset of the illness indicates that 57.3 percent of the paralytic cases, or 65.2 percent of all reported cases including nonparalytic ones, have or probably will have nearly unlimited activity and will not be seriously handicapped in their ability to earn a living. Twenty-seven percent of the paralytic cases have limited activity; 5.7 percent are incapacitated; and 10 percent have died. The evidence does not indicate any difference in the degree of residual paralysis among the various age groups, or among persons attacked at different times during the epidemic.

ACKNOWLEDGMENTS

The authors are indebted to Dr. F. A. Hoshall, State orthopedic consultant, and Mr. F. O. Bates, superintendent of Roper Hospital, for permission to examine the records of patients; to Dr. G. E. McDaniel, epidemiologist of the South Carolina State Board of Health,

and Dr. Leon Banov, health officer of Charleston, S. C., for assistance in the study; and to Passed Assistant Surgeon A. G. Gilliam, United States Public Health Service, under whose direction the study was initiated.

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CAUSES OF PHYSICAL DISQUALIFICATION UNDER THE SELECTIVE SERVICE LAW. EARLY INDICATIONS

By Rollo H. Britten, *Senior Statistician*, and George St. J. Perrott, *Chief, Division of Public Health Methods, National Institute of Health, United States Public Health Service*

A serious state of ill-health of American youth is revealed by the figures available as to the results of medical examinations made so far under the Selective Service Law of 1940. Early indications are that more than 40 percent of examined men are being classified as unfit for general military service. This estimate includes (*a*) rejection by Selective Service local boards as unfit for any military service (Class IV–F, about 20 percent of examined men), (*b*) classification by local boards as fit for limited military service only (Class I–B, about 12 percent), and (*c*) rejection at Army induction centers (Classes I–B and IV–F, 11 percent, based on the population examined by local boards), yielding a total of 43 percent. The combined rate for rejection from any military service (Class IV–F) by local boards and induction centers is about 28 percent.

The local board figures represent an estimate based on review of a large proportion of the examination records received by the National Headquarters of the Selective Service System, and cover the period from the beginning of examinations under the Act to about the end of March.[1] The induction center data are based on complete figures for the period up to February 1 (18,971 men returned to local boards

[1] Based on release from Selective Service System, dated April 24, 1941. Acknowledgment is made to Lt. Oliver H. Folk, Medical Division, National Headquarters, Selective Service System, for making data available at the earliest possible moment and for assistance in interpretation.

out of 120,689 men examined at induction centers).[2] It will be observed that the induction center figures just quoted yield a percentage of 15.7, rather than the 11 percent given in the first paragraph. Since the induction center examinations constitute a second screening of the men who appear before the local boards, it is most reasonable to regard the population base for induction center examinations as the number appearing before local boards. The correction is obtained by multiplying the 15.7 by 0.68 (the proportion of men examined at local boards who were sent to induction centers).[3] It should be pointed out that the men returned by induction centers to local boards were classified as either rejected for any military service (Class IV-F) or as qualified for limited military service only (Class I-B). The percentages of examined men (based on the total appearing before local boards) classified in these two groups by the induction centers were, respectively, 7.9 (Class IV-F) and 2.8 (Class I-B).

In interpreting these findings, the question of age is of importance. The draft ages are 21 to 35. However, the effect of deferments for reasons other than physical status tends to concentrate the group examined in the ages 21 to 25, the period when physical health should be at its best.

The rates of disqualification thus far under the Selective Service Act of 1940 are higher than those observed during most of the period of the World War, when less than a third were classified as unfit for general military service.[4] However, this fact does not justify the conclusion that the health of American youth is inferior today to what it was 20 years ago. Improved diagnostic techniques, changes in physical standards, a different situation with respect to the immediate urgency for manpower, and many other factors enter in to invalidate comparisons. The important point is that a large proportion of men in the most healthy ages are deficient in health to the extent that they are being classified as unfit for general military service and that many of the conditions from which they suffer are of a remediable, often of a preventable, nature.

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[2] Release by the Office of the Surgeon General of the Army, dated April 12, 1941. Acknowledgment is made to Col. John W. Meehan, Office of the Surgeon General, U. S. Army, for making data available at the earliest possible moment and for assistance in interpretation.

[3] That is, 1 minus the sum of 0.20 and 0.12. It is to be noted that the correction is equivalent to that which would be obtained by multiplying the number of men examined at induction centers by the ratio of 1 to 0.68.

[4] See the following:

Reports of the Provost Marshal General to the Secretary of War on the Operations of the Selective Service System. Government Printing Office, Washington. First Report 1917; Second Report 1919.

Love, Albert G., and Davenport, Charles B.: Defects found in drafted men. Statistical information compiled from the draft records, showing the physical conditions of the men registered and examined in pursuance of the requirements of the Selective Service Act. Government Printing Office, Washington, 1920.

Britten, Rollo H., and Perrott, George St. J.: Summary of physical findings on men drafted in the World War. Pub. Health Rep., 56: 41 (1941). Reprint No. 2223.

Deep interest attaches to the relative importance of the various causes of disqualification. Tabulations have been made by both the National Headquarters of the Selective Service System and by the Office of the Surgeon General of the Army according to the primary cause for disqualification. In table 1 these data have been combined to show the percentage of examined men who were classified as not qualified for general military service, according to certain specific impairments or groups of impairments, the detail being such as is permitted from the present preliminary tabulations. The table also gives the rates separately for rejection (Class IV–F) and for classification as qualified for limited military service only (Class I–B). Table 2 gives corresponding data as a percentage distribution in which all causes is equal to 100. The local board data [5] by cause are based on a sample of examination reports for men classified as not available for general military service (14,593 men unfit for any military service and 6,432 men fit for limited service only). The induction center data [6] are complete for all examinations made up to February 1.[7]

[5] Based on release from Selective Service System referred to above. The data given in the release are in the form of a percentage distribution of rejected (or limited service) men according to cause. The two series were multiplied, respectively, by 0.20 and 0.12 to give the rates per 100 examined men.

[6] Based on release from the Office of the Surgeon General of the Army referred to above, supplemented by certain information made available directly through the kindness of Col. John W. Meehan of that office For the purpose of these preliminary figures, it has been necessary to apply the percentages for Class IV–F and Class I–B (7.9 and 2.8, respectively) to each cause.

[7] The percentages of examined men (see second paragraph of this article) classified as not qualified for general military service (Class IV–F and Class I–B) by local boards and by induction centers separately are as follows:

	Local boards	Army induction centers
All	32 00	10.68
Defective or deficient teeth	6 26	2.06
Eye diseases	3 62	1.41
Diseases of the cardiovascular system	3 03	.66
Musculo-skeletal diseases	2.05	.52
Nervous and mental diseases	1 83	1.12
Ear, nose, throat diseases	1.37	1.02
Hernia	1.46	.56
Diseases of the respiratory system	1.18	.53
Venereal diseases	1.13	.49
Foot diseases	1.03	.39
Overweight and underweight	1.05	.32
Diseases of the genito-urinary system	.62	.46
Endocrine disturbances	.49	.090
Varicose veins	.35	.13
Mouth and gum diseases	.22	.17
Skin diseases	.16	.15
Diseases of abdominal viscera	.31	
Hemorrhoids	.15	.073
Underheight	.10	
Other specified diseases	.075	.51
Generally unfit	2.83	
Obviously defective	2.06	

TABLE 1.—*Percentage of examined men classified as not qualified for any military service or as qualified for limited service only under the Selective Service Act of 1940,*[1] *according to cause*

Diseases[2]	Percentage of examined men classified as—		
	Not qualified for general military service[3] (Classes IV-F and I-B)	Not qualified for any military service (Class IV-F)	Qualified for limited service only (Class I-B)
All	42.68	27.92	14.76
Defective or deficient teeth	8.32	4.33	3.99
Eye diseases	5.03	2.51	2.53
Diseases of the cardiovascular system	3.69	3.02	.67
Musculo-skeletal diseases	3.17	2.11	1.07
Nervous and mental diseases	2.95	2.54	.41
Ear, nose, throat diseases	2.39	1.77	.61
Hernia	2.02	.93	1.10
Diseases of the respiratory system	1.71	1.33	.39
Venereal diseases	1.62	1.02	.60
Foot diseases	1.42	.77	.65
Overweight and underweight	1.37	.75	.62
Diseases of the genito-urinary system	1.08	.72	.36
Endocrine disturbances	.58	.49	.10
Varicose veins	.48	.34	.14
Mouth and gum diseases	.39	.30	.094
Skin diseases	.31	.23	.079
Diseases of abdominal viscera	.31	.23	.082
Hemorrhoids	.22	.12	.10
Underheight	.10	.10	.004
Other specified diseases	.58	.44	.14
Generally unfit	2.83	1.80	1.03
Obviously defective[4]	2.06	2.06	....

[1] These data are a combination of local board and induction center examinations. See text for description of how the rates were obtained.
[2] The term "disease" is used to mean disease, defects, or impairments. Data are classified by primary cause.
[3] Sum of second and third columns.
[4] Classified by local boards as obviously defective without medical examination.

TABLE 2.—*Percentage distribution of (a) men not qualified for any military service according to cause and (b) men qualified for limited military service only, according to cause*[1]

Diseases[2]	Percentage distribution		Diseases[2]	Percentage distribution	
	Not qualified for any military service (Class IV-F)	Qualified for limited service only (Class I-B)		Not qualified for any military service (Class IV-F)	Qualified for limited service only (Class I-B)
All	100.00	100.00	Overweight and underweight	2.69	4.20
Defective or deficient teeth	15.51	27.03	Diseases of the genito-urinary system	2.58	2.44
Eye diseases	8.99	17.14	Endocrine disturbances	1.76	.68
Diseases of the cardiovascular system	10.82	4.54	Varicose veins	1.22	.95
Musculo-skeletal diseases	7.56	7.25	Mouth and gum diseases	1.07	.64
Nervous and mental diseases	9.10	2.78	Skin diseases	.82	.54
Ear, nose, throat diseases	6.34	4.13	Diseases of abdominal viscera	.82	.56
Hernia	3.33	7.45	Hemorrhoids	.43	.68
Diseases of the respiratory system	4.76	2.64	Underheight	.36	.027
Venereal diseases	3.65	4.07	Other specified diseases	1.58	.95
Foot diseases	2.76	4.40	Generally unfit	6.45	6.98
			Obviously defective[3]	7.38	....

[1] These data are a combination of local board and induction center examinations. See text for description of how the rates were obtained.
[2] The term "disease" is used to mean disease, defects, or impairments. Data are classified by primary cause.
[3] Classified by local boards as obviously defective without medical examination.

The fact that 8 percent of all examined men, largely in the ages from 21 to 25, are being classified as not available for general military service by reason of tooth defects is a cause for serious concern and points to the need for more extended dental care. Next in order of frequency are eye defects and diseases (mostly defective vision). Consideration of the other groups will reveal many which are made up largely of remediable conditions. The correction of defects among youth must be regarded as of importance not only from the point of view of military man power, but also from that of industrial man power and public health generally. Furthermore, over and above the need for remedial care which these figures show is the realization that many of the impairments could have been prevented by more extended public health programs during the period of growth of these individuals. This fact emphasizes the need for further development of such programs in the future.

A PORTABLE UNIT FOR THE DETERMINATION OF HALOGENATED HYDROCARBONS [1]

By H. C. Dudley, *Associate Chemist, United States Public Health Service*

The wide use of solvents as cleaners, vehicles, and degreasers has occasioned the introduction of compounds or mixtures having little or no fire hazard. The chlorinated hydrocarbons thus enter into many manufacturing processes requiring solvents which resist ignition. In the study of workroom atmosphere contaminated by various halogenated hydrocarbons, there arose a need for an easily portable rugged sampling apparatus. The apparatus here described was built in this laboratory. It is designed to be easily carried by one person, while sufficiently rugged to withstand shipment.

The apparatus has been extensively used during the past 3 years, being applied to the sampling of workroom atmospheres for carbon tetrachloride, trichlorethylene, methyl bromide, and the like. Although not primarily designed for the purpose, units have been used successfully in studying high concentrations of methyl bromide in fumigation chambers and greenhouses.

The principle of this sampling device is similar to that employed by others, the air stream being passed through some type of heated tube, which serves to decompose the organic halides. Methods of absorption of the halides vary but all are based on some simple gas-scrubbing device. Sampling devices based on these principles but differing somewhat in design, portability, and ruggedness have been described by Olsen et al. (*1*) and Tebbens (*2*).

[1] From the Division of Industrial Hygiene, National Institute of Health.

APPARATUS AND METHODS

The sampling apparatus consists of a calibrated flowmeter, with a thin disc orifice, a one-piece quartz tube containing platinum gauze or coils (the whole tube heated by an external electrical resistance), and two bubblers connected in series. Figures 1 and 2 show details of the apparatus.

The air stream is drawn through the unit by means of a vacuum pump of convenient design. In usual practice where house vacuum lines are not available a rotary type, motor-driven pump has been

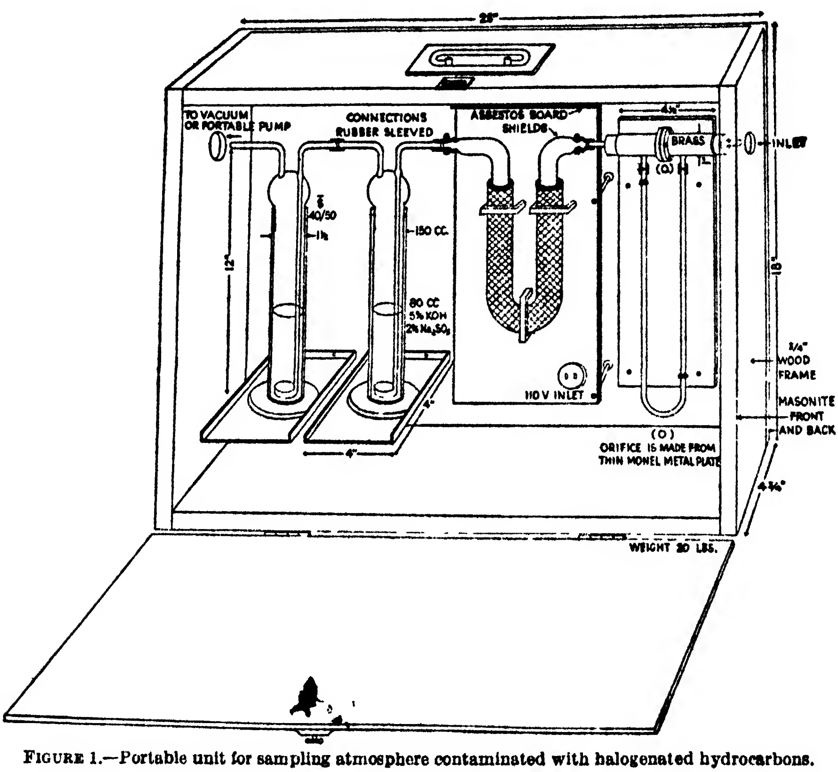

FIGURE 1.—Portable unit for sampling atmosphere contaminated with halogenated hydrocarbons.

used. Commercial pump units suitable for 110–220 alternating current or direct current in a separate carrying case are convenient. Those used for impinger dust sampling will operate two of these units simultaneously, with individual control by means of by-pass needle valves.

The air flow of two separate units used in various studies was 2.45 liters per minute and 2.40 liters per minute. The flow was calibrated against standard dry meters, under actual operating conditions. A flow of approximately 2.5 liters per minute has been found to be the most convenient from the standpoint of time in sampling low concentrations of organic halides in air, and is near the maximum flow

which bubblers of this size and type will handle efficiently. In sampling workrooms of the usual type a run of 30 minutes or longer is required to obtain sufficient halogen for determination by most chemical methods. In the case of high concentrations of methyl bromide in fumigation chambers and greenhouses a sampling time of 5 to 10 minutes was ample.

The heating element surrounding the quartz tube (see fig. 2) was made from Nichrome wire, the length and size of wire adjusted so

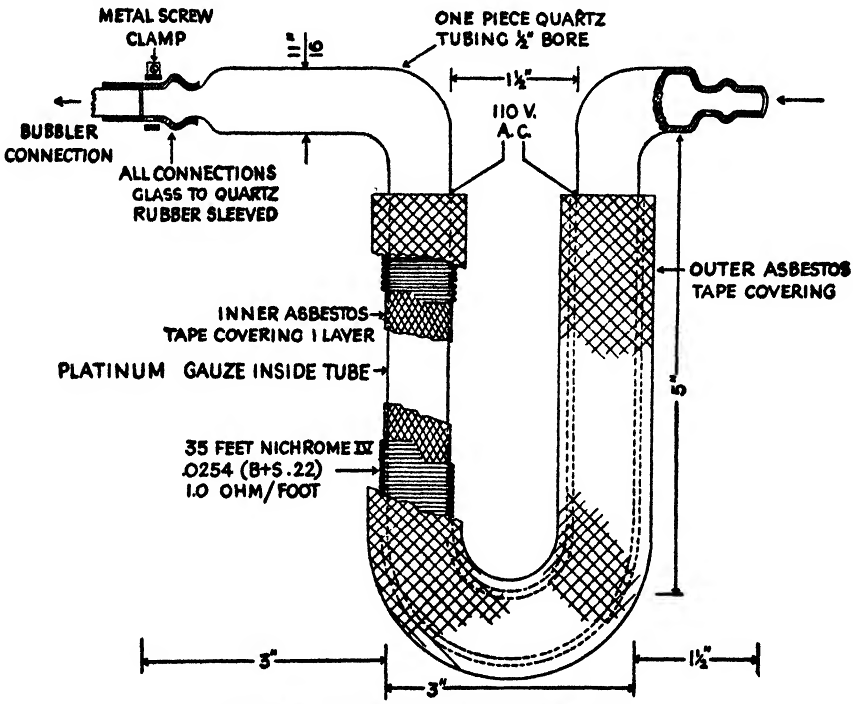

FIGURE 2.—Details of combustion tube assembly.

that a temperature of about 800° C. was obtained at 110 volts alternating current. In general the quartz tube containing platinum gauze or spiral effectively decomposes the organic halogen compounds if a bright red or red-orange color is noted under the entire length of the asbestos tape wrapping. At 110 volts alternating current the heating elements draw approximately 4 amperes when 35 feet of Nichrome IV, 0.0254 (B. & S. 0.22), are used in the winding. In two cases the heater elements have been in use for more than a year without replacement.

CHEMICAL PROCEDURE

Into each bubbler there was placed 80 cc. of a solution of 5 percent potassium hydroxide and 2 percent sodium sulfite. The ground glass stoppers of the bubblers were lightly greased, and the sampling was

begun. When the sampling was complete, the bubblers were removed from the case, the contents poured into separate flasks, and the bubblers rinsed with distilled water. The bubbler fluids from the two bubblers were analyzed separately.

The basic sulfite solutions, containing an excess of both potassium hydroxide and sodium sulfite, were made acid with 12 normal sulfuric acid, and potassium permanganate solution was added dropwise until the solution was cleared of excess sulfur dioxide. An excess of permanganate is to be avoided.

From this point a number of chemical methods for the determination of halogens suggest themselves. The usual Volhardt procedure, in which an excess of silver nitrate is added and the excess back titrated with thiocyanate, has been used. The difficulties found here have been due largely to a decomposition of the thiocyanate to the cyanide. When larger quantities of halogens are present the errors are negligible. However, the more laborious procedure of a gravimetric determination of the silver halides has been found to be more advantageous with smaller amounts of halogens. Filtered bubbler solutions and reagents must be used in this last procedure, and reagent blanks are required because of the quantity of reagents and volume of the final solutions.

It must be stressed that there should be an excess of sodium sulfite in the bubblers in order to convert all the halogen compounds to the simple halogen acids after acidification with sulfuric acid. In moist air the combustion in the quartz tube is largely carried to completion, with the formation of HCl, HBr, etc. However, when dry air is being sampled there is evidence which shows that other more complex compounds are formed, i. e., $COCl_2$, $COBr_2$, etc., as well as free chlorine and bromine. It is the purpose of the sulfite to convert these materials to the corresponding simple halogen acids. It has been found that an insufficient amount of sulfite caused a loss of chlorides when standard samples of carbon tetrachloride or trichlorethylene were being analyzed.

Concentrations lower than 1 mg. of organic halogen per liter of air gave negative findings in the second bubbler at air flows of less than 2.5 liters per minute, that is if the units were in perfect working order. If much halogen is noted in the second bubbler when moderate concentrations of halogenated hydrocarbons are being sampled it is evidence that some part of the apparatus is functioning incorrectly.

In order to determine the absolute efficiency of this apparatus a series of determinations were made using purified carbon tetrachloride and trichlorethylene. The units were placed in operation at the calibrated flow, and air from the room was drawn through them, as

in regular field procedures. A small weighed bubbler containing the solvent was arranged so that air forced through the small bubbler entered the intake of the unit. The solvent vapors then mixed with the air stream and the resultant chlorides were determined by a gravimetric procedure as AgCl. The small bubbler was accurately weighed before and after the test run, the difference in weight giving the quantity of solvent entering the units. Table 1 gives the details of the findings of these test runs. The results indicate that recovery is quantitative. These solvents were used in the check tests since it is believed that they are representative of the usual chlorinated hydrocarbons employed industrially and that they are also more resistant to thermal decomposition.

TABLE 1.—*Efficiency of units as shown by analysis of weighed amounts of carbon tetrachloride and trichlorethylene*

Run	Bubbler	AgCl weighed, gm.[1]	Total solvent calculated, gm.[2]	Total solvent taken, gm.	Run	Bubbler	AgCl weighed, gm.[1]	Total solvent calculated, gm.[2]	Total solvent taken, gm.
Carbon tetrachloride (CCl_4) [3]					Trichlorethylene ($ClCH{:}CCl_2$) [4]				
A	1	0.6293	0.1712	0.1715	E	1	0.3207	0.0997	0.0997
	2	0.0088				2	0.0056		
B	1	0.2048	0.0554	0.0552	F	1	0.4965	0.1527	0.1545
	2	0.0019				2	0.0032		
C	1	0.6435	0.1749	0.1728	G	1	0.7592	0.2358	0.2387
	2	0.0081				2	0.0125		
D	1	0.9194	0.2476	0.2468	H	1	0.2526	0.0772	0.0787
	2	0.0043				2	0.0000		

[1] Weight of AgCl given here corrected for total reagent blank equal to 0.0032 gm. AgCl.
[2] Factors AgCl to CCl_4: 0.2683.
AgCl to C_2HCl_3. 0.3056.
[3] Average recovery 100.4 percent.
[4] Average recovery 98.9 percent.

Tables 2 and 3 show some results obtained in actual field determinations using this apparatus.

TABLE 2.—*Results of sampling various workrooms for halogenated hydrocarbons*

Compound known to be present	Sampling time, min.	Volume of sample, liters	Total hydrocarbon determined, mg.	Calculated concentration, mg./liter	Remarks
Carbon tetrachloride	17	41	12.60	0.31	
Do.	18	32	4.98	.15	
Do.	27	65	36.47	.56	
Trichlorethylene	30	73.5	Trace	----------	
Methyl bromide	30	72	0.97	.013	
Do.	5	12	28.70	2.4	Duplicate runs at same time.
Do.	5	12.3	35.56	2.9	
Do.	5	12	33.02	2.8	Do.
Do.	5	12.3	38.78	3.1	

TABLE 3.—*Results of tests of concentrations of CH_3Br in fumigation chambers*

(A) Steel lined chamber. Unit 1, sampling rate=2.40 liters/min. Volume of air samples=12 liters.

		Mg. CH_3Br found	Percent recovery of theoretical	Concentration found mg./liter
Run 1	Bubbler 1	372.97	97.1	
	Bubbler 2	8.44	2.2	31.7
			99.3	
Run 2	Bubbler 1	346.33	90.2	
	Bubbler 2	16.20	4.3	30.1
			94.5	
Run 3	Bubbler 1	399.86	104.1	
	Bubbler 2	6.00	1.6	33.8
			105.7	
		Theoretical concentration		32.0

(B) Tests of units sampling simultaneously. Theoretical concentration not known because of rapid leakage from concrete chamber.
Unit 1, sampling rate 2.40 liters/min. All samples 5 min.=12 liters.
Unit 2, sampling rate 2.45 liters/min. All samples 5 min.=12.3 liters.

			Mg. CH_3Br found	Concentration mg. CH_3Br/liter
Run 4	Unit 1	Bubbler 1	335.6	28.7
		Bubbler 2	9.2	
	Unit 2	Bubbler 1	340.5	28.5
		Bubbler 2	9.7	
Run 5	Unit 1	Bubbler 1	302.6	25.2
		Bubbler 2	Trace	
	Unit 2	Bubbler 1	322.0	26.4
		Bubbler 2	Trace	
Run 6	Unit 1	Bubbler 1	58.2	4.9
		Bubbler 2	None	
	Unit 2	Bubbler 1	58.2	4.7
		Bubbler 2	None	

DISCUSSION

The apparatus described is an outgrowth of several years' application of many modifications of this basic design. At air flows of less than 2 liters per minute a considerably longer time is required to obtain sufficient amounts of halogen for satisfactory analysis. The sintered glass foot type of bubbler has been found to be an efficient gas scrubber under most conditions at flows less than 3 liters per minute. Likewise, the simplicity of design of these bubblers makes rinsing out of the absorbing fluids more efficient.

The combustion method of converting the organic halides to a form which may be readily determined by inorganic procedure makes impossible a simple determination of the separate components of mixed halogenated hydrocarbons, especially when two or more chlorine compounds are being used in solvent mixtures. In rare instances bromine and chlorine compounds may be used as solvents

so that various chemical methods could be instituted with the bubbler solutions to determine separately these two ions.

The flow meters were calibrated for one rate of flow and during sampling were adjusted by means of by-pass needle valves in the suction lines so that the manometer liquid (water) remained at the calibration markings. The volume of air passing through the apparatus was determined from the calibrated flow and the length of sampling, timed with a stop watch.

The rubber connections used in this apparatus deteriorate rather rapidly owing to the heat from the electrical resistance and therefore must be replaced at frequent intervals. Ground glass connections were tried in order to overcome this difficulty but unequal thermal expansion caused opening of the connections so that leaks were unavoidable.

In preparing the unit for shipment, the bubblers and manometer tube were packed in separate containers. The manometer tube was filled with colored water before sampling was begun.

Samples at ceiling level may be obtained by connecting glass tubing to the intake with the unit remaining at a convenient working height.

SUMMARY

A portable unit for the thermal decomposition and determination of halogenated hydrocarbons in air is described in detail. Analysis of standard samples indicates that, at a sampling rate of 2.5 liters per minute, recovery of carbon tetrachloride and trichlorethylene is quantitative.

REFERENCES

(*1*) Olsen, J. C., Smyth, Henry F., Jr., Ferguson, George E., and Scheflan, Leopold: Determination of the concentration of vaporized carbon tetrachloride. J. Ind. Eng. Chem., Anal. Ed., **8**: 260–263 (1936).

(*2*) Tebbens, B. D.: Portable combustion apparatus for field determinations of chlorinated hydrocarbons. J. Ind. Hyg. and Toxicol., **19**: 204–211 (1937).

COURT DECISION ON PUBLIC HEALTH

Order of State stream control commission requiring city to construct sewers and sewage treatment plant upheld.—(Michigan Supreme Court; *City of Niles* v. *Stream Control Commission*, 296 N.W. 713; decided March 11, 1941.) Acting under the provisions of the law creating it the Stream Control Commission of Michigan ordered the city of Niles to construct sewers and an approved sewage treatment plant. This order followed unsuccessful endeavors by the commission to have the city take care of its sewage. The statute authorized the commission to make regulations and orders restricting the polluting

content of any waste material or polluting substance discharged or sought to be discharged into any lake, river, stream, or other waters of the State and also authorized the commission to take all appropriate steps to prevent any pollution which was deemed by it to be unreasonable and against public interest in view of the existing conditions in any lake, river, stream, or other waters of the State. The city challenged the order of the commission as being unreasonable in view of the unusual conditions existing in the St. Joseph River on which the city was located and into which it was discharging untreated sewage. The unusual conditions complained of were the large deposits of industrial waste and sewage discharged by certain Indiana cities and universities into the St. Joseph River immediately before it entered Niles.

The supreme court, in holding that the order in question was not arbitrary or unreasonable, said that, in order to stop pollution of the river, it was necessary for the commission to take action against the city of Niles inasmuch as it was the first city in the State, on the course of the river, below the Indiana cities and thus open the way for suit to compel the Indiana cities to stop pollution of the waters of the river. "It is an instance where the State must clean up its own door yard before being in a position to ask or seek to compel its neighbor to clean up." This, according to the court, was not an arbitrary exercise of power by the commission but a practical movement toward accomplishment of a most desirable end.

DEATHS DURING WEEK ENDED APRIL 26, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 26, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,308	8,484
Average for 3 prior years	8,551	
Total deaths, first 17 weeks of year	157,961	158,255
Deaths per 1,000 population, first 17 weeks of year, annual rate	13.0	13.0
Deaths under 1 year of age	539	504
Average for 3 prior years	507	
Deaths under 1 year of age, first 17 weeks of year	9,143	8,702
Data from industrial insurance companies:		
Policies in force	64,547,387	65,664,534
Number of death claims	12,510	13,544
Death claims per 1,000 policies in force, annual rate	10.1	10.8
Death claims per 1,000 policies, first 17 weeks of year, annual rate	10.6	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 3, 1941

Summary

An abrupt decline was recorded in the incidence of measles, from 50,609 cases for the preceding week to 43,880 for the current week. Decreases were reported in all geographic areas except the West South Central and Mountain. The Middle Atlantic, East North Central, and South Atlantic areas have had predominantly the highest incidence rates during the present epidemic. To date this year (first 18 weeks) a total of 583,263 cases of measles has been reported as compared with 586,012 for the corresponding period in 1938.

The number of reported cases of poliomyelitis increased from 16 to 20, as compared with the preceding week. Michigan, with 6 cases, reported the largest number, and Kentucky and California were next with 3 cases each. The total number of cases reported to date this year, 424, is slightly below the number reported for the corresponding period last year, 427. The highest incidence this year has been recorded for the East North Central and South Atlantic States. In the latter area, Florida has reported 46 of the 103 cases, of which 30 cases occurred in Dade County.

The current incidence of diphtheria, meningococcus meningitis, scarlet fever, smallpox, and typhoid fever is below the 5-year (1936–40) median expectancy.

Of 69 cases of smallpox, 41 cases, or approximately 60 percent, were reported in the two North Central areas, 17 cases occurring in Missouri and 6 each in Indiana and Michigan. Fifteen cases were reported in Oregon but no cases in the other two Pacific States (Washington and California).

Eight cases of Rocky Mountain spotted fever were reported in the Mountain States and 1 case was reported in Virginia. Of 12 cases of endemic typhus fever, 4 were reported in Alabama and 3 in Texas.

The death rate for the current week in 88 major cities of the United States was 11.6 per 1,000 population, the same as for last week. This is only slightly above the 3-year (1938–40) average of 11.5. The cumulative rate for the first 18 weeks (annual basis) is 12.9, the same as for the corresponding period of last year.

Telegraphic morbidity reports from State health officers for the week ended May 3, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40
	May 3, 1941	May 4, 1940		May 3, 1941	May 4, 1940		May 3, 1941	May 4, 1940		May 3, 1941	May 4, 1940	
NEW. ENG.												
Maine	0	1	1	3	1	2	199	566	177	0	0	0
New Hampshire	0	0	0	------	------	------	89	0	50	1	0	0
Vermont	1	0	0	------	------	------	72	2	44	0	0	0
Massachusetts	1	0	5	------	------	------	975	566	683	1	2	2
Rhode Island	2	0	0	2	------	------	3	200	66	0	1	1
Connecticut	1	3	5	1	8	3	302	76	167	0	1	0
MID. ATL.												
New York	19	12	39	[1] 5	[1] 16	[1] 7	5,619	713	2,181	7	7	7
New Jersey	2	4	7	6	6	6	2,698	786	786	1	1	3
Pennsylvania	19	23	33	------	------	------	5,624	445	1,135	1	5	5
E. NO. CEN.												
Ohio	16	3	23	9	26	11	4,638	19	527	3	0	2
Indiana	6	9	5	13	10	11	1,066	17	19	0	0	1
Illinois	22	18	25	11	13	38	2,148	121	121	1	1	3
Michigan [2]	3	2	8	2	12	3	3,503	629	584	1	1	1
Wisconsin	0	0	1	37	38	56	1,873	680	680	0	1	1
W. NO. CEN.												
Minnesota	3	1	2	2	5	2	25	116	254	0	0	3
Iowa	2	5	2	3	------	2	218	191	191	0	0	0
Missouri	3	7	4	------	5	24	633	23	20	0	2	1
North Dakota	1	1	1	6	2	3	31	4	4	0	0	0
South Dakota	0	1	1	------	1	1	14	5	5	1	3	0
Nebraska	0	0	1	------	------	------	12	24	76	0	0	0
Kansas	4	1	2	8	7	4	990	653	62	1	0	1
SO. ATL.												
Delaware	0	0	0	------	------	------	158	0	10	0	0	0
Maryland [3]	2	7	6	3	6	8	403	2	292	3	0	2
Dist. of Col	0	0	2	------	------	------	299	3	103	0	0	1
Virginia [3]	5	4	9	109	110	110	1,518	196	458	3	3	8
West Virginia [3]	2	7	7	15	41	41	753	60	60	0	1	3
North Carolina [4]	13	11	11	3	10	30	1,792	100	152	2	2	2
South Carolina	5	5	5	270	400	223	987	25	55	1	0	1
Georgia [4]	5	3	3	58	38	------	717	148	111	0	1	1
Florida	0	1	2	61	1	2	468	220	209	0	0	1
E. SO. CEN.												
Kentucky	2	4	4	4	12	16	1,025	95	95	3	3	7
Tennessee	1	2	4	27	16	74	565	190	84	1	1	1
Alabama [4]	5	5	5	22	45	174	626	63	63	0	1	3
Mississippi [2]	5	2	5	------	------	------	------	------	------	1	0	1
W. SO. CEN.												
Arkansas [4]	0	3	4	75	58	66	370	20	20	0	0	0
Louisiana [4]	2	2	9	8	14	16	47	6	52	0	2	2
Oklahoma	7	2	6	61	80	80	148	25	79	0	2	3
Texas [4]	28	33	30	729	372	372	1,541	1,120	584	0	2	2
MOUNTAIN												
Montana [3]	2	2	2	------	16	16	51	90	35	0	0	0
Idaho	0	0	0	------	------	1	10	22	29	0	0	0
Wyoming [3]	0	0	1	------	------	------	34	52	25	0	0	0
Colorado [3]	11	15	10	18	10	------	636	51	51	0	1	0
New Mexico	0	0	1	1	------	1	246	36	38	0	0	0
Arizona	1	1	1	124	109	50	98	104	104	0	1	0
Utah [2]	4	0	0	13	------	------	29	694	77	0	0	0
Nevada	0	------	------	------	------	------	2	------	------	0	------	------
PACIFIC												
Washington	2	0	1	14	------	------	44	712	399	0	0	1
Oregon	3	4	0	20	9	28	226	591	88	1	1	0
California	8	11	28	312	35	36	355	259	686	0	1	1
Total	218	215	346	2,050	1,532	1,532	43,880	10,721	13,129	83	47	64
18 weeks	5,045	6,185	8,872	584,614	160,776	141,425	583,263	127,341	167,826	886	738	1,480

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 3, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40
	May 3, 1941	May 4, 1940		May 3, 1941	May 4, 1940		May 3, 1941	May 4, 1940		May 3, 1941	May 4, 1940	
NEW ENG.												
Maine	0	0	0	4	15	18	0	0	0	0	1	1
New Hampshire	0	0	0	1	4	4	0	0	0	0	0	0
Vermont	0	0	0	12	4	5	0	0	0	0	0	0
Massachusetts	0	0	0	196	151	251	0	0	0	5	10	1
Rhode Island	0	0	0	5	12	12	0	0	0	0	0	0
Connecticut	0	0	0	76	93	84	0	0	0	2	0	0
MID. ATL.												
New York	0	0	2	507	1,100	910	0	0	0	6	5	6
New Jersey	0	0	0	294	383	223	0	0	0	3	3	4
Pennsylvania	0	1	1	377	495	495	0	0	0	7	7	7
E. NO. CEN.												
Ohio	2	1	1	296	325	325	1	0	0	3	24	9
Indiana	1	0	0	103	114	150	6	6	23	0	8	1
Illinois	0	0	0	287	800	618	2	2	7	4	2	2
Michigan [3]	6	0	0	285	356	374	6	1	3	3	0	1
Wisconsin	0	0	0	92	122	206	3	1	3	1	0	0
W. NO. CEN.												
Minnesota	0	1	0	44	84	132	2	2	10	0	0	0
Iowa	0	0	0	40	53	141	2	13	36	1	2	2
Missouri	0	0	0	141	73	192	17	3	19	0	1	2
North Dakota	0	0	0	3	9	15	1	7	7	2	0	1
South Dakota	0	0	0	19	15	15	1	1	18	0	0	0
Nebraska	0	0	0	29	6	23	0	4	4	0	0	0
Kansas	0	1	0	46	61	98	0	0	7	1	3	1
SO. ATL.												
Delaware	0	0	0	17	9	8	0	0	0	0	0	0
Maryland [3]	0	1	0	40	33	53	0	0	0	0	2	2
Dist. of Col.	0	0	0	13	35	20	0	0	0	2	1	1
Virginia [3]	0	0	0	12	63	31	0	0	0	0	2	2
West Virginia [3]	[5] 0	0	0	41	41	41	0	0	0	2	8	7
North Carolina [4]	0	1	1	23	36	21	0	2	0	0	0	0
South Carolina	0	0	0	7	3	2	0	0	0	3	4	3
Georgia [4]	0	0	0	15	13	12	1	0	0	7	2	5
Florida	1	0	1	1	3	6	0	0	0	3	1	2
E. SO. CEN.												
Kentucky	3	0	0	108	83	38	0	0	0	10	5	4
Tennessee	1	0	0	66	85	27	0	0	0	4	2	3
Alabama [4]	0	0	1	12	12	4	0	11	1	1	1	2
Mississippi [3]	0	0	0	1	10	6	4	1	1	1	1	1
W. SO. CEN.												
Arkansas [4]	1	0	1	5	1	3	0	2	0	2	5	3
Louisiana [4]	0	0	0	4	6	8	0	0	0	2	2	7
Oklahoma	0	1	1	24	18	20	0	12	12	0	3	3
Texas [4]	2	2	1	43	26	73	3	18	14	6	3	10
MOUNTAIN												
Montana [3]	0	0	0	24	31	21	0	0	8	2	1	1
Idaho	0	0	0	5	5	10	0	0	3	1	0	0
Wyoming [3]	0	0	0	3	9	11	0	0	2	0	0	0
Colorado [3]	0	2	0	29	30	37	0	4	4	1	0	0
New Mexico	0	0	0	6	7	11	0	0	0	0	1	1
Arizona	0	0	0	4	6	11	5	0	0	0	0	1
Utah [3]	0	0	0	13	7	11	0	0	0	2	0	0
Nevada	0			0			0			0		
PACIFIC												
Washington	0	0	0	15	48	34	0	0	8	0	1	1
Oregon	0	0	0	16	13	26	15	4	12	1	0	0
California	3	2	2	126	122	174	0	1	11	5	4	5
Total	20	13	13	3,530	5,030	5,030	69	95	252	93	115	125
18 weeks	[3] 424	427	359	66,760	86,787	105,200	821	1,332	5,737	1,375	1,461	1,990

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 3, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended—May 3, 1941	Whooping cough, Week ended—May 4, 1940	Division and State	Whooping cough, Week ended—May 3, 1941	Whooping cough, Week ended—May 4, 1940
NEW ENG.			SO. ATL.—continued		
Maine	8	26			
New Hampshire	28	11	Georgia [4]	20	21
Vermont	11	35	Florida	26	7
Massachusetts	225	166			
Rhode Island	21	17	E. SO. CEN.		
Connecticut	73	11	Kentucky	99	123
			Tennessee	42	47
MID. ATL.			Alabama [4]	47	35
New York	285	279	Mississippi [2]	-------	-------
New Jersey	116	124			
Pennsylvania	334	350	W. SO. CEN.		
E. NO. CEN.			Arkansas [4]	27	30
Ohio	404	173	Louisiana [4]	3	13
Indiana	47	27	Oklahoma	33	37
Illinois	91	98	Texas [4]	339	291
Michigan [2]	440	157			
Wisconsin	94	143	MOUNTAIN		
W. NO. CEN.			Montana [3]	19	0
			Idaho	3	3
Minnesota	103	18	Wyoming [3]	1	4
Iowa	55	38	Colorado [3]	217	4
Missouri	56	11	New Mexico	7	50
North Dakota	36	7	Arizona	43	11
South Dakota	23	1	Utah [2]	98	153
Nebraska	17	9	Nevada	0	-------
Kansas	146	40			
			PACIFIC		
SO. ATL.					
Delaware	5	17	Washington	153	64
Maryland [2]	88	142	Oregon	27	20
Dist. of Col.	14	4	California	658	354
Virginia [3]	96	32			
West Virginia [5]	67	33	Total	5,201	3,330
North Carolina [4]	291	67			
South Carolina	165	27	18 weeks	80,034	55,202

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended May 3, 1941, 9 cases, as follows: Virginia, 1; Montana, 3; Wyoming, 1; Colorado, 4.
[4] Typhus fever, week ended May 3, 1941, 12 cases, as follows: North Carolina, 1; Georgia, 1; Alabama, 4; Arkansas, 1; Louisiana, 2; Texas, 3.
[5] Information has been received that diagnosis was changed in 1 of 2 cases of poliomyelitis in West Virginia published in the PUBLIC HEALTH REPORTS of Apr. 25, 1941, p. 918.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 19, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	115	194	67	5,233	652	2,084	20	385	20	1,212	--------
Current week	59	130	51	16,520	429	1,357	0	332	8	1,267	--------
Maine:											
Portland	1	------	0	1	3	0	0	0	0	9	18
New Hampshire:											
Concord	0	------	0	11	0	0	0	0	0	0	14
Manchester	0	------	0	0	0	3	0	2	0	0	12
Nashua	0	------	0	0	0	0	0	0	0	0	10
Vermont:											
Barre	0	------	0	0	0	0	0	2	0	0	2
Burlington	0	------	0	3	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	2
Massachusetts:											
Boston	0	------	0	290	12	66	0	10	0	36	220
Fall River	1	------	0	3	0	10	0	1	0	3	45
Springfield	0	------	0	24	0	16	0	0	0	1	34
Worcester	1	------	0	81	4	7	0	1	0	6	42
Rhode Island:											
Pawtucket	0	------	0	1	0	1	0	0	0	0	15
Providence	0	1	0	3	1	2	0	1	0	10	57
Connecticut:											
Bridgeport	0	1	1	15	4	5	0	0	0	5	57
Hartford	0	------	0	4	3	3	0	0	0	4	32
New Haven	0	------	1	1	1	22	0	0	0	4	36
New York:											
Buffalo	0	------	2	106	5	30	0	3	0	12	150
New York	13	16	4	5,146	82	295	0	69	1	65	1,519
Rochester	0	------	0	254	5	2	0	0	0	33	62
Syracuse	0	------	0	0	6	2	0	1	0	22	60
New Jersey:											
Camden	0	2	2	42	3	23	0	0	0	0	35
Newark	0	1	0	184	8	36	0	5	0	14	115
Trenton	0	1	0	52	1	39	0	0	0	0	40
Pennsylvania:											
Philadelphia	0	1	0	1,391	31	124	0	24	2	60	557
Pittsburgh	1	3	4	791	16	15	0	4	0	59	191
Reading	0	------	0	95	1	1	0	1	0	1	27
Scranton	0	------	--------	34	-------	1	0	-------	0	0	--------
Ohio:											
Cincinnati	1	1	0	297	2	17	0	8	0	2	130
Cleveland	3	6	3	528	17	60	0	8	0	62	196
Columbus	0	1	1	246	4	13	0	1	0	22	85
Toledo	0	------	0	408	6	4	0	3	0	23	90
Indiana:											
Anderson	0	------	0	27	0	0	0	0	0	0	10
Fort Wayne	0	------	0	44	0	1	0	1	0	6	28
Indianapolis	3	------	0	672	10	20	0	2	0	22	119
Muncie	1	------	0	78	0	13	0	0	0	0	16
South Bend	0	------	0	45	1	1	0	0	0	0	18
Terre Haute	0	------	0	5	3	0	0	0	0	0	23
Illinois:											
Alton	0	------	0	6	2	1	0	0	0	0	12
Chicago	15	3	2	1,093	38	162	0	30	1	32	747
Elgin	0	------	0	129	0	3	0	0	0	0	5
Moline	0	------	0	37	0	1	0	0	0	0	10
Springfield	0	------	0	6	1	6	0	0	0	0	20
Michigan:											
Detroit	1	------	0	922	8	99	0	7	1	96	282
Flint	0	------	0	167	4	5	0	0	0	6	26
Grand Rapids	0	1	0	549	2	7	0	0	0	3	29
Wisconsin:											
Kenosha	0	------	0	168	0	0	0	0	0	0	7
Madison	0	------	0	36	2	14	0	0	0	1	6
Milwaukee	0	2	2	641	3	26	0	3	0	33	100
Racine	0	------	0	38	1	6	0	0	0	2	11
Superior	0	------	0	1	0	4	0	0	0	5	8

City reports for week ended April 19, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0	------	0	0	1	1	0	0	0	24	26
Minneapolis	2	------	1	9	2	15	0	3	0	49	115
St. Paul	0	1	1	4	7	2	0	1	0	21	85
Iowa:											
Cedar Rapids	0	------	------	12	------	1	0	------	0	0	------
Davenport	0	------	------	6	------	5	0	------	0	0	------
Des Moines	1	------	------	9	------	4	0	------	0	0	31
Sioux City	0	------	------	4	------	1	0	------	0	8	------
Waterloo	0	------	------	48	------	1	0	------	0	0	------
Missouri:											
Kansas City	0	------	0	130	4	7	0	2	0	10	107
St. Joseph	0	------	0	22	5	0	0	0	0	2	20
St. Louis	0	6	2	306	9	73	0	8	0	33	214
North Dakota:											
Fargo	0	------	1	2	0	1	0	0	0	15	8
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	1	------	------	16	------	2	0	------	0	1	5
South Dakota:											
Aberdeen	0	------	------	1	------	0	0	------	0	0	------
Sioux Falls	0	------	------	0	------	5	0	------	0	0	9
Nebraska:											
Lincoln	1	------	------	1	------	3	0	------	0	0	------
Omaha	3	------	0	2	6	3	0	1	0	1	51
Kansas:											
Lawrence	0	------	0	24	0	2	0	0	0	0	------
Topeka	0	------	0	232	2	3	0	0	0	22	13
Wichita	1	------	0	5	6	3	0	0	0	16	31
Delaware:											
Wilmington	0	------	0	70	1	2	0	0	0	0	38
Maryland:											
Baltimore	0	3	2	156	18	18	0	10	0	45	240
Cumberland	0	------	0	4	1	1	0	0	0	4	11
Frederick	0	------	0	1	0	1	0	0	0	2	5
Dist. of Col.:											
Washington	0	3	1	346	8	14	0	19	1	13	176
Virginia:											
Lynchburg	1	------	0	6	1	0	0	0	0	0	10
Norfolk	0	9	0	282	6	1	0	0	0	0	35
Richmond	0	------	1	95	2	2	0	3	0	0	51
Roanoke	0	------	1	65	1	0	0	2	0	0	18
West Virginia:											
Charleston	0	1	0	1	3	0	0	1	0	0	36
Huntington	0	------	------	287	------	0	0	------	0	4	------
Wheeling	0	------	0	42	0	3	0	0	0	1	20
North Carolina:											
Gastonia	0	------	0	45	------	0	0	------	0	6	------
Raleigh	0	------	0	87	1	0	0	0	0	28	12
Wilmington	0	------	0	0	1	1	0	0	0	19	10
Winston-Salem	0	------	0	39	1	1	0	2	0	12	18
South Carolina:											
Charleston	0	7	0	44	1	0	0	1	0	1	21
Florence	0	------	0	0	0	0	0	0	0	0	9
Greenville	0	------	0	35	1	0	0	1	0	28	12
Georgia:											
Atlanta	0	1	1	45	3	0	0	7	0	1	76
Brunswick	0	------	0	61	2	0	0	0	0	0	6
Savannah	0	15	3	28	1	2	0	2	0	11	36
Florida:											
Miami	0	2	0	21	2	2	0	2	0	9	45
St. Petersburg	0	------	1	49	4	1	0	0	0	0	25
Tampa	0	------	0	2	0	0	0	0	0	4	25
Kentucky:											
Ashland	0	------	1	1	0	0	0	2	0	1	10
Covington	0	------	0	15	1	1	0	0	0	0	11
Lexington	0	------	0	12	0	0	0	1	0	2	17
Louisville	0	------	0	862	3	46	0	6	0	13	70
Tennessee:											
Knoxville	1	------	0	84	2	7	0	0	0	7	18
Memphis	0	3	1	101	2	4	0	7	0	20	81
Nashville	0	------	1	116	6	3	0	2	0	9	43
Alabama:											
Birmingham	1	10	0	130	3	8	0	2	0	0	67
Mobile	0	1	0	3	0	0	0	1	0	0	21
Montgomery	0	------	------	35	------	0	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	89	------	0	0	------	0	2	------
Little Rock	0	3	0	4	2	2	0	1	0	3	15

City reports for week ended April 19, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	1	------	0	0	0	0	0	0	0	1	4
New Orleans	1	3	2	13	12	4	0	9	0	8	142
Shreveport	0	------	0	4	2	0	0	4	0	1	35
Oklahoma:											
Oklahoma City	0	1	1	5	3	3	0	2	1	0	48
Tulsa	0	------	0	63	1	0	0	0	0	12	11
Texas:											
Dallas	2	------	0	41	4	4	0	6	1	6	57
Fort Worth	1	------	1	78	1	5	0	2	0	1	32
Galveston	0	------	0	4	1	0	0	1	0	0	28
Houston	2	3	2	0	2	6	0	6	1	0	61
San Antonio	0	4	2	1	6	0	0	10	0	1	62
Montana:											
Billings	0	------	0	0	1	1	0	0	0	1	11
Great Falls	0	------	0	0	1	0	0	1	0	0	14
Helena	0	------	0	1	0	1	0	0	0	0	2
Missoula	0	1	1	0	0	1	0	0	0	0	6
Idaho:											
Boise	0	------	0	9	1	1	0	0	0	0	6
Colorado:											
Colorado Springs	0	------	0	3	1	3	0	0	0	5	12
Denver	5	9	1	332	3	1	0	7	0	88	80
Pueblo	0	------	0	5	1	0	0	2	0	26	13
New Mexico:											
Albuquerque	0	1	1	32	0	2	0	3	0	0	13
Arizona:											
Phoenix	0	29	------	7	------	0	0	------	0	2	------
Utah:											
Salt Lake City	0	------	0	5	1	2	0	1	0	7	52
Washington:											
Seattle	1	------	3	0	1	2	0	1	0	18	77
Spokane	0	------	0	8	4	2	0	1	0	0	40
Tacoma	0	------	0	3	0	1	0	0	0	6	22
Oregon:											
Portland	1	------	0	17	3	0	0	0	0	2	62
Salem	0	------	------	1	------	2	0	------	0	3	------
California:											
Los Angeles	0	14	1	51	3	35	0	13	0	46	326
Sacramento	0	------	0	6	1	0	0	0	0	39	33
San Francisco	0	2	1	13	5	6	0	13	0	19	187

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Maryland:			
Boston	1	0	0	Baltimore	4	1	0
New York:				District of Columbia:			
New York	1	0	0	Washington	1	0	0
New Jersey:				South Carolina:			
Camden	1	0	0	Charleston	1	0	0
Pennsylvania:				Kentucky:			
Philadelphia	2	0	0	Louisville	1	0	0
Scranton	2	1	0	Louisiana:			
Michigan:				Shreveport	0	1	0
Detroit	2	0	0	Texas:			
Missouri:				Dallas	1	0	0
St. Louis	1	0	0	Houston	1	1	0

Encephalitis, epidemic or lethargic.—Cases: Springfield, Ill., 1. Deaths: New York, 2.
Pellagra.—Cases: Trenton, 1; Philadelphia, 1; Savannah, 1; New Orleans, 1; Houston, 1; San Antonio, 1.
Rabies in man.—Deaths: Cincinnati, 1.
Typhus fever.—Cases: New York, 2; St. Petersburg, 1; New Orleans, 1.

TERRITORIES AND POSSESSIONS

VIRGIN ISLANDS OF THE UNITED STATES

Notifiable diseases—January–March 1941.—During the months of January, February, and March 1941, cases of certain notifiable diseases were reported in the Virgin Islands of the United States as follows:

Disease	January	February	March	Disease	January	February	March
Filariasis	6	5		Schistosomiasis	1		
Gonorrhea	13	14	16	Syphilis	20	15	20
Hookworm disease	5	5	5	Tuberculosis	2	3	2
Malaria	2	3	5				

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended March 29, 1941.—During the week ended March 29, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	2	5		3	18	2		3	2	35
Chickenpox	1	1		152	193	36	15	47	74	519
Diphtheria	1	19		25	1	2				48
Dysentery				1						1
Influenza	1	45			2				13	61
Measles	8	185	15	316	1,278	70	167	222	1,071	3,332
Mumps				346	399	24	22	19	30	840
Pneumonia	4	22			6				6	38
Scarlet fever		26	2	167	215	17	3	11	21	462
Tuberculosis	3	10	6	55	74	25				173
Typhoid and paratyphoid fever	8	1	1	12	3				2	27
Whooping cough				93	147	1	7	9	22	279

JAMAICA

Communicable diseases—4 weeks ended April 12, 1941.—During the 4 weeks ended April 12, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	7	34	Scarlet fever	1	
Diphtheria	4	4	Tuberculosis	46	86
Dysentery	5	5	Typhoid fever	7	41
Leprosy	1	2			

YUGOSLAVIA

Notifiable diseases—4 weeks ended February 23, 1941.—During the 4 weeks ended February 23, 1941, certain notifiable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	8		Paratyphoid fever	6	1
Cerebrospinal meningitis	191	39	Poliomyelitis	10	
Diphtheria and croup	479	28	Scarlet fever	252	2
Dysentery	36	4	Sepsis	4	1
Erysipelas	143	6	Tetanus	9	6
Favus	8		Typhoid fever	308	21
Lethargic encephalitis	2	2	Typhus fever	58	10

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of April 25, 1941, pages 924-928. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Smallpox

Cuba—Santiago de Cuba.—During the week ended April 5, 1941, 1 case of smallpox was reported in Santiago de Cuba.

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Public Health Reports

VOLUME 56 MAY 16, 1941 NUMBER 20

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE 1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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TANNIC ACID TREATMENT OF POISON IVY (RHUS SPP.) DERMATITIS

By Louis Schwartz, *Medical Director*, and Leon H. Warren, *Acting Assistant Surgeon (Dermatology), United States Public Health Service* [1]

The many substances proposed for the treatment of poison ivy dermatitis do not differ essentially from those used in the treatment of any acute vesicular dermatitis, except that oxidizing agents such as potassium permanganate have been advocated with a view to oxidizing and thus rendering nonirritant the active principle of the plant. Recently the authors found that oxidizing agents are also useful as preventives (*1*). In addition to oxidizing agents the medicaments commonly used for the treatment of poison ivy dermatitis include calamine lotion, lead acetate, zinc sulfate, sodium hyposulfite, aluminum acetate, boric acid, etc.

In a search of the literature no reference has been found to tannic acid recommended specifically in the treatment of poison ivy dermatitis, although Sulzberger and Wolfe (*2*) and Warren (*3*) include among a list of other wet dressings 2 to 5 percent tannic acid solution for the treatment of vesicular dermatitis (eczema).

The dermatitis caused by poison ivy and many other plants manifests itself, in most instances, as a vesicular eruption. The vesicles vary in size and may become large bullae resembling second-degree burns. Tanning with tannic acid of the opened blisters of burns is accepted as one of the best forms of treatment, and it seemed to the authors that it might be applicable in the treatment of opened vesicles and bullae of plant dermatitis.

As this procedure was decided upon late in the poison ivy season, there has been opportunity to test it on only 11 patients having dermatitis presumably caused by poison ivy. Of the 11 patients treated, one failed to return for final observation. The itching and discomfort stopped within 1 or 2 days after beginning treatment in 9 of the patients, and all had recovered at the end of 1 week. The tenth case, which was suspected of having been caused by crab grass (*Syntherisma*

[1] From the Division of Infectious Diseases, National Institute of Health.

sanguinalis, reported by Shelmire to be a cause of dermatitis) and not by poison ivy, was symptomatically well in 10 days but the remains of the eruption (consisting of crusts and pigmentation) were present at the end of 2 weeks.

The first patient whom we treated had an eruption limited to the calf of the leg. The dermatitis had been present for 2 weeks, but was still itching and exhibited erythema, small vesicles, and scratch marks; the eruption had been treated ineffectually with calamine lotion containing phenol. The area was rubbed vigorously with a piece of gauze soaked in 95 percent alcohol, removing the tops from the vesicles. The alcohol was then allowed to evaporate, leaving an oozing surface. The serum was wiped off with gauze and a 10-percent aqueous solution of tannic acid was painted on. This was allowed to dry for one-half hour and another application was made and allowed to dry. The patient was given a 2-ounce bottle of the 10-percent tannic acid solution and directed to apply the solution to the eruption twice daily. He was also told that if any new vesicles appeared these were to be rubbed with alcohol until the tops were rubbed off, when the tannic acid solution should be applied. The patient returned the next day with the lesion completely crusted over with a thin adherent crust and the subjective symptoms gone (fig. 1). No new vesicles had appeared, and in 1 week's time the crust had fallen off and the skin had become normal.

The eruptions in the other cases were more extensive, involving the face and extremities. It was thought that instead of painting on the tannic acid solution it might better be applied as wet dressings after the tops of the vesicles had been rubbed off with alcohol-saturated gauze or the tops clipped off with scissors. Patients were instructed to rub off the tops of any new vesicles and to apply the wet dressings daily for one-half-hour periods. No dressing was used after the compress had been applied. In only one of these cases did the pruritus fail to respond to a few applications of tannic acid solution. In this case the addition of 3 percent phenol to the wet dressing stopped the itching. Phenol itself is a protein coagulant and tanning agent. It is suggested that in cases where the pruritus is so severe that the tannic acid does not relieve it, phenol 1 to 3 percent may be added to the solution. In extensive cases not more than 1 percent of phenol should be used for compresses on account of the danger of systemic absorption. In such case the patient should be under the observation of the physician for signs of systemic absorption and poisoning by phenol—dark smoky urine, diarrhea, colic, and myosis. In cases having blisters of sufficient size, it is suggested that they be opened or the tops be clipped off and alcohol applied and allowed to evaporate before the tannic acid solution is applied (fig. 2).

FIGURE 1.—Vesicles treated with tannic acid solution after their tops had been removed by rubbing.

FIGURE 2.—Blebs treated with tannic acid solution after their tops had been removed with scissors.

In two of the cases treated, the lesions on one side of the body were treated with another tanning agent, 10 percent aluminum sulfate, but it was less efficacious than the tannic acid solution.

This treatment is reported in the hope that other physicians will give it a trial, and either confirm or disprove the efficacy of this treatment on a larger number of patients.

REFERENCES

(1) Schwartz, Louis, Warren, Leon H., and Goldman, Frederick H.: Protective ointment for the prevention of poison ivy dermatitis. Pub. Health Rep., 55: 1327 (July 26, 1940).
(2) Sulzberger, Marion B., and Wolfe, Jack: Dermatologic Therapy in General Practice. The Year Book Publishers, Inc., Chicago, 1940.
(3) Warren, Leon H.: Handbook of Skin Diseases. Paul B. Hoeber, Inc., New York, 1940, p. 11.

STUDIES ON IMMUNIZING SUBSTANCES IN PNEUMOCOCCI[1]

XII. COMPARISON OF THE EFFECT OF WHOLE-CELL VACCINE AND OF POLYSACCHARIDE ANTIGEN IN HUMAN BEINGS

By Lloyd D. Felton, *Senior Surgeon, United States Public Health Service;* Carl F. Jordan, *Director, Division of Preventable Diseases, Iowa State Department of Health;* E. N. Hesbacher, *Director, Polk County (Iowa) Health Service;* and Ellis K. Vaubel, *Assistant Director, Division of Preventable Diseases, Iowa State Department of Health*

In recent studies on antibody production in man following the injection of an antigenic polysaccharide of the pneumococcus, a great individual variation was observed in this trait (*1*). This variation in response to the same dose of antigen was so great as to suggest the

[1] From the Division of Infectious Diseases, National Institute of Health, Washington, D. C., and the State Department of Health of Iowa. This is one of a series of studies carried out in part under a grant from the Influenza-Pneumonia Commission of the Metropolitan Life Insurance Co.

Preceding papers in the series on studies on immunizing substances in pneumococci are:

I. Active immunization of white mice by a nonpolysaccharide and probably nonprotein derivative of the pneumococcus. By L. D. Felton J. Immunol., 23 405 (1932).

II. Separation of the organism into acid soluble and acid insoluble fractions. By L. D. Felton. J. Immunol., 27 379 (1934).

III. The precipitation of bacterial polysaccharides with calcium phosphate; pneumococcus. By L. D. Felton, G. Kauffmann, and H J. Stahl. J. Bact., 29: 149 (1935).

IV. Antigenic characteristics in man of certain products of the pneumococcus Comparison with vaccine. By L. D. Felton, W. D Sutliff, and B F Steele. J Infect. Dis, 56: 101 (1935).

V. The effect of alkalis on the immunizing properties of a type I pneumococcus polysaccharide. By L. D. Felton and B. Prescott. Bull. Johns Hopkins Hosp, 59: 114 (1936).

VI. The essential immunizing antigen of types I and II pneumococci. By L. D. Felton and G. Kauffmann. Bull Johns Hopkins Hosp., 62: 430 (1938).

VII. Response in human beings to antigenic pneumococcus polysaccharides, types I and II. By L. D. Felton. Pub. Health Rep., 53. 1855-1877 (1938).

VIII. Report on field tests to determine the prophylactic value of a pneumococcus antigen. By G M. Ekwurzel, J. S. Simmons, L. I. Dublin, and Lloyd D. Felton. Pub. Health Rep., 53: 1877–1893 (1938).

IX. Cutaneous tests in nonimmunized and immunized individuals in relationship to serum antibody content. By L. D. Felton and P. F. Prather. Pub. Health Rep., 54: 1053-1070 (1939).

X. The relationship between the acetyl group on type I pneumococcus polysaccharide and antigenicity. By L. D. Felton and B. Prescott. J. Bact., 38: 579-593 (1939).

XI. Effect of variation in dosage of antigenic polysaccharide on serum antibody titer in human beings. By L. D. Felton, W. R. Cameron, and P. F. Prather. Pub. Health Rep., 56: 822 (1941).

possibility that susceptibility or nonsusceptibility may be related to this individual characteristic. The response was observed to vary at least a millionfold, as measured by the number of lethal doses against which mice would be protected with 0.1 cc. of serum from those immunized. In other words, those who can manufacture antibody readily may be resistant, whereas those unable to do so, or able only to slight degree, may be susceptible to this infection. The latter group represents the real problem in a program directed toward prevention of pneumonia by active immunization. Yet if the above assumption be true, and if it is found possible to separate the general population into nonsusceptible and susceptible groups, then a practical program of prophylaxis may become feasible, for those who respond but poorly represent only 10 to 15 percent of the general population.

Again, such a program would be successful only if a method of immunizing the susceptible group could be discovered. So far endeavors to stimulate antibody production in those found to be poor reactors in previous tests have been of little avail. Obviously, unless there is an unknown type of response from an antigen resulting in an increase in host resistance, protection against pneumonia rests on the host's ability to manufacture serum antibody. From this standpoint it becomes necessary to find either a better method of application or an antigen which will stimulate serum antibody in all alike. Should this be impossible, then a study of host factors which influence the production of serum antibody must be made. There are these two possibilities, but they are not considered all-inclusive.

Thus far our work has been limited mostly to the antigenic form of the pneumococcus polysaccharide. Although preliminary studies have been made to compare this antigen with the whole cell vaccine (*2*), insufficient numbers were investigated to make significant deductions. For that reason, an attempt has been made to compare in human beings the relative activity of the antigenic polysaccharide and the whole-cell vaccine. Two main points are to be emphasized: First, a comparison of the variation in individual capacity to manufacture antibody from these two antigens; and, second, an answer to the query as to whether a second injection of the whole-cell vaccine will stimulate a higher titer of antibody in good reactors and result in a decrease in the number of individuals in the poor-reactor group.

MATERIALS

Two whole-cell vaccines were made from type I and type II organisms in the following manner: Type I pneumococci were inoculated, 10 percent by volume, into 800 cc. of a 2 percent peptone meat infusion broth to which 0.2 percent dextrose had been added. After incubation at 37° C. for 8 hours, the organisms were killed with 0.4 percent formaldehyde, stored in the ice box overnight, and then col-

lected at high speed in a refrigerating centrifuge. The sedimented organisms were washed with physiologic salt solution and centrifugalized at high speed (5,800 r. p. m.) in an angle centrifuge at room temperature. The volume was 40 cc. Half the amount, 20 cc., was then suspended in c. p. acetone, held at room temperature overnight, filtered, washed with acetone, and dried in a vacuum desiccator. A similar procedure was followed for type II. These acetone-dried organisms were then weighed (type I=124 mg., type II=158 mg.) and made into a vaccine containing 1 mg. per cc. of each type, I and II, in physiologic salt solution with 0.25 percent phenol added as preservative. The total number of organisms of the combined types was then 1,710,000,000 per cc. The 20 cc. of wet organisms were suspended in salt and diluted until there was approximately this same number of organisms to a cubic centimeter (count was 1,800,000,000). The preparation of acetone-dried organisms was designated lot No. 3, and the nondried, lot No. 4. This small dose of vaccine (2 mg. per cc.) was used in an attempt to avoid the usual severe reactions following injection of whole-cell vaccines. However, even with this dose some severe reactions followed the injection of the wet vaccine, to such degree that only 29 individuals were immunized with this preparation. On the other hand, little untoward effect was observed following the use of the acetone-dried organisms. Previously, with other vaccines dried in this way, as much as 5 mg. (9,000,000,000 organisms) have been injected in one dose without causing any inconvenience to the person injected (*3*).

For the polysaccharide antigen, sufficient dried material prepared by the calcium phosphate method (*4*) was weighed to make 0.8 mg. type I and 0.4 mg. type II per cc., and was dissolved in physiologic salt solution, to which was then added 0.25 percent phenol. This amount of this particular antigen, No. 29, was chosen arbitrarily because in human beings it stimulated optimum response as measured by production of serum antibodies. The clear solution was then filtered through a Seitz pad and ampouled. Both vaccines and polysaccharide antigen were tested for sterility and showed no growth after 10 days.

A description of both vaccine and polysaccharide preparations and their antigenicity for white mice is given (tables 1 and 2). It is seen that a single intraperitoneal injection of 0.5 cc. of a 1:100 dilution of the vaccine preparation which contained 1 mg. of each type per cc. (=0.005 mg. type I) immunized mice in 7 days to such degree that they withstood a million lethal doses of virulent organisms of type I. That is true for both vaccines Nos. 3 and 4. This same dose of vaccine immunized mice so that they withstood 500,000 lethal doses of type II. The specific polysaccharide preparations were tested before combining the two types into lot No. 29. For assay

of their antigenicity, mice in groups of 10 were injected once with 0.5 cc. of a 1:1,000,000 dilution (0.0005 mg.), and 7 days later tested for protection against 5,000, 50,000, 500,000, and 1,000,000 lethal doses. With both types, mice were found to be immune against a million lethal doses. If an "immunizing dose" is considered to be that quantity of antigen necessary to immunize mice against a million lethal doses, then 1 mg. of each type contains 2,000 immunizing doses. Hence, lot No. 29 used in human beings, comprising 0.8 mg. type I and 0.4 mg. type II per cc., contained 800 and 400 mouse immunizing doses, respectively, in the 0.5 cc. dose injected. Similarly calculated, vaccine No. 3 in 0.5 cc. dose contained 100 and 50 mouse immunizing doses, respectively, of each type.

TABLE 1.—*Titration of pneumococcus vaccine in white mice. All mice received injection of 0.5 cc. of the specified dilutions of a 6-hour autopsy culture*

Vaccine lot (dil. = 1:100)	Number of survivals of 10 vaccinated mice							
	Type I culture dilutions			Type II culture dilutions				
	1:500	1:1,000	1:10,000	1:500	1:1,000	1:10,000		
No. 3	6	8	10	3	5	7		
No. 4	6	8	8	2	5	7		
	Survival time of nonvaccinated mice							
	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}
Control	[1] 22 22 22	22 22 24	22 22 24	24 24 S	22 22 22	22 22 48	22 22 24	22 24 S

[1] Numbers refer to hours of survival, S indicates survival.

TABLE 2.—*Polysaccharide antigen No. 29. Description of materials before combining*

Type	Nitrogen	Glucose number	Optical rotation	Precipitin titer	Immune precipitable nitrogen				
					1:2,500	1:5,000	1:10,000	1:15,000	1:20,000
	Percent	*Percent*	*Degrees*						
I	2.95	11.70	+140	1:5,000,000	....	0.646	0.532	0.470	0.358
II	1.76	56.16	+55	1:5,000,000	0.314	.304	.272	.272	.244

TABLE 2—Continued

Titration in white mice. All mice received injection of 0.5 cc. of the specified dilutions of a 6-hour autopsy culture

	Number of survivals of 10 inoculated mice							
	Type I culture dilutions				Type II culture dilutions			
	1:500	1:1,000	1:10,000	1:100,000	1:500	1:1,000	1:10,000	1:100,000
Polysaccharide (1:1,000,000).	6	8	9	10	5	9	9	10
	Survival time of noninoculated mice							
	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}
Control	[1] 22 22 22	22 22 22	22 22 24	22 24 S	18 18 18	18 18 18	18 18 20	20 24 S

[1] Numbers refer to hours of survival, S indicates survival.

PROCEDURE FOR STUDY IN HUMAN BEINGS

The study in human beings was made on institutionalized, ambulatory persons. Those injected with the polysaccharide antigen received a single dose of 0.5 cc. subcutaneously With the whole-cell vaccine, there were two injections—the dose for the first was 0.25 cc. and for the second, 14 days later, 0.5 cc. To test for serum antibody, blood was withdrawn before and from 14 to 21 days after injection of the polysaccharide antigen, and similarly before and 14 days after the first injection and again from 14 to 21 days after the second injection of the vaccine. The serums were studied for protective antibodies in mice by a method the details of which are given elsewhere (*5*). In addition, Francis-Tillett skin tests (*6*) were carried out prior to and 14 days after injection of each dose of either polysaccharide or vaccine.

RESULTS WITH VACCINE

A summary of the results of the use of vaccine is shown in table 3. It includes sections A and B, showing the results in persons whose serums were titrated before and after only one injection of lots Nos. 3 and 4 vaccine, respectively; and section C, giving the results in 79 individuals on whom serum tests were done before and after each of two injections with either vaccine, irrespective of the mode of preparation. Because of the small number in each group, those individuals whose serums (0.1 cc.) protected against only one lethal dose and those not protected at all are tabulated together, and similarly those protected against 10 and 100 lethal doses, 1,000 and 10,000, and against 100,000 and 1,000,000 lethal doses.

TABLE 3.—*Results of immunization of human beings with whole-cell vaccine*

Type	Total number	Persons whose serums protected against following lethal doses							
		Numbers lethal doses [1]				Percent lethal doses [1]			
		0-1	10-100	1,000-10,000	100,000-1,000,000	0-1	10-100	1,000-10,000	100,000-1,000,000
		A. Lot No. 3							
I. Before injection	63	60	2	1	0	95.2	3.2	1.6	0
After injection	61	8	10	32	11	13.1	16.4	52.5	18.0
II. Before injection	63	48	8	6	1	76.2	12.7	9.5	1.6
After injection	60	2	2	33	23	3.3	3.3	55.0	38.3
		B. Lot No. 4							
I. Before injection	29	23	3	3	0	79.3	10.3	10.3	0
After injection	29	5	1	17	6	17.2	3.4	58.6	20.7
II. Before injection	29	25	1	2	1	86.2	3.4	6.9	3.4
After injection	29	1	5	13	10	3.4	17.2	44.8	34.5
		C. Combined results, lots No. 3 and No. 4, including all who received a second injection							
I. Before injection	79	73	5	1	0	92.4	6.3	1.3	0
After first injection	79	13	12	44	10	16.5	15.2	55.7	12.6
After second injection	79	11	16	41	11	13.9	20.3	51.9	13.9
II. Before injection	79	64	8	5	2	81.0	10.1	6.3	2.5
After first injection	78	3	4	45	26	3.8	5.1	57.7	33.3
After second injection	79	4	7	31	37	5.1	8.9	39.2	46.8

[1] Lethal doses against which 0.1 cc. serum protects mice.

Although in the two groups injected once with lots Nos. 3 or 4 whole-cell vaccine, there was a difference in the percentage of individuals who had serum antibodies prior to inoculation, the difference in response stimulated by the two preparations was slight. In other words, in consideration of the individual variation, the acetone-dried organisms were as efficient antigenically as the wet organisms from which they were prepared. On the other hand, while no severe reactions followed injection of the acetone-dried vaccine, the wet vaccine produced sufficient untoward reactions to limit its use to 29 individuals. In section C are shown the results after first and second inoculations of 79 individuals. The number of individuals was less than in sections A and B together, owing to the fact that some did not receive a second injection. In this group there is little evidence that a second injection stimulated additional serum antibodies. In the case of type I, whereas only 3 in the group increased as much as one hundredfold in antibody titer, 5 showed a decrease to this extent. Furthermore, there were 13 persons who were negative after the first injection, of whom only 3 responded to a second injection. One of these gave antibody titer such that 0.1 cc. serum protected against 10 lethal doses, and 2 were protected against 100 lethal doses. On the

other hand, with type II, 7 individuals showed a one hundredfold increase after the second injection, while 10 showed a decrease to this same degree, and 2 individuals failed to respond to either the first or second injection. It would thus appear that with the present whole-cell vaccine one injection stimulates serum antibody as effectively as two spaced as they have been in this study, 14 days apart. The slight differences noticed might well be due to the lack of sensitivity of the present method of assay. Certain numbers of individuals were unable to manufacture serum antibody from a dose of antigen to which a majority of those tested responded well but to varying degree.

COMPARISON WITH POLYSACCHARIDE ANTIGEN

In the case of the polysaccharide antigen, only one immunizing injection was made because it was found previously that there is no apparent advantage in a second dose, at least when given 2 weeks later. Data on this subject are being published elsewhere (*7*). The findings on the serum antibody tests on the 92 individuals included in the present study are summarized in table 4 and, as may be seen, are similar to those in previous studies (*1*). However, since the purpose of this investigation is to make a comparison of antigen and whole-cell vaccine, the results of these tests will be discussed in connection with those shown in the previous table.

TABLE 4.—*Results of immunization of human beings with polysaccharide antigen lot No. 29*

Type	Total number	Persons whose serums protected against the following lethal doses [1]							
		Number				Percent			
		0-1	10-100	1,000-10,000	100,000-1,000,000	0-1	10-100	1,000-10,000	100,000-1,000,000
I. Before injection	92	72	15	5	0	78.3	16.3	5.4	0
After injection	92	10	27	37	18	10.9	29.3	40.2	19.6
II. Before injection	92	67	14	8	3	72.8	15.2	8.7	3.3
After injection	92	4	5	42	41	4.3	5.4	45.6	44.6
		Results in larger group for comparison [2]							
I. Before injection	1,099	935	113	46	5	85.1	10.3	4.2	0.5
After injection	1,099	89	189	561	260	8.1	17.2	51.0	23.6
II. Before injection	1,098	905	129	56	8	82.4	11.7	5.1	.7
After injection	1,097	18	104	535	440	1.6	9.5	48.8	40.1

[1] Lethal doses against which 0.1 cc. serum protects mice.
[2] From Am. J. Pub. Health, 30: 361-368 (1940).

Although there is a difference in the percentage of individuals in the two groups who were negative before immunization, the percentage of those who failed to respond to type I was less with the antigen (10.9 percent) than with the vaccine (16.5 percent). With type II,

the percentage who failed to respond was practically the same, 4.3 and 3.8 percent, respectively, for antigen and vaccine. The numbers in the groups are too small to make a detailed analysis. Yet it should be pointed out that the largest group in both cases is that in which 0.1 cc. serum protects against 1,000 to 10,000 lethal doses; with type I this group comprises 55 percent of the total of those receiving vaccine and 40 percent of the total of those receiving polysaccharide antigen; and with type II the groups are 57 and 45 percent, respectively. However, this is counterbalanced by the fact that, whereas serum of only 12 percent of those vaccinated protected against 100,000 to 1,000,000 lethal doses, 19.6 percent of those receiving soluble antigen were of this titer; with type II the corresponding percentages were 33 and 44 percent, respectively. Hence it may be concluded at present that the serum antibody response in human beings with a given dose of either whole-cell vaccine or antigenic polysaccharide is similar if not identical. The variation in response is due not to the antigen but to the capacity of the individual to manufacture antibody to pneumococcus antigen.

The results obtained with the use of polysaccharide antigen in this group of individuals compare favorably with those already published (*1*) in which tests were reported on the serums of more than 1,000 individuals before and after immunization with polysaccharide antigen. With type I the percentage of this group without serum antibody before immunization differed only slightly from that of the large group, 78 and 85 percent, respectively. Also, after immunization, the percentage of those who failed to respond was similar, 10.9 and 8.1 percent. In like manner, with type II the percentages without antibody were, respectively, before injection 72.8 and 82.4 percent, and after immunization, 4.3 and 1.6 percent. Thus the present results would seem to be what might be expected with such an antigen. However, the important consideration is the great variation in the capacity of different individuals to manufacture serum antibodies.

RESULTS OF SKIN TESTS

The Francis-Tillett skin test was carried out before and after injections on all those immunized with either vaccine or polysaccharide antigen. Reactions were classified in the manner reported by Felton and Prather (*8*). Comparison was made of the four possible relationships between skin tests and serum antibody, namely both tests positive, i. e., the degree of correlation between antibody and positive skin test; both tests negative; negative antibody with positive skin test; and positive antibody with negative skin test. The first and last are perhaps the most important. Before summarizing the results, it should be stated that about 80 percent of the individuals in these groups were 40 years of age or above, and consequently the results of

the skin tests may not be representative of those found in an average population of different age groups. In the case of the vaccine, before injection of the first dose, the number positive in both tests was relatively low, 22 percent for type I and 5 percent for type II. After immunization with a single injection, 78 percent were positive for type I and 64 percent for type II in both tests, serum antibody and skin reaction (table 5). After the second injection, 79 percent were positive for type I and 58 percent for type II. If comparisons are made between positive serum-positive skin and positive serum-negative skin reactions, then 5 percent of the type I and 32 percent of the type II who had protective serum antibody were missed by the skin test. The percentage of those negative in both tests after a single dose of vaccine was only 2.5 percent with either types I or II. The largest discrepancies were in the serum negative-skin positive with type I and serum positive-skin negative with type II. Such discrepancy might be due in part to the particular immunizing or skin test antigen, or immunological and physical variations of the individual, "physical" here referring particularly to the texture of the skin. Again inasmuch as the immunizing antigens used gave similar antibody responses and one skin test antigen was used throughout, it is possible that the lack of reactivity here may have been due to the large proportion of individuals in higher age brackets.

TABLE 5.—*Correlation of skin reaction and serum antibody following vaccine injections*

Type	Total number	Number of persons[1]				Percent			
		+serum +skin	+serum −skin	−serum +skin	−serum −skin	+serum +skin	+serum −skin	−serum +skin	−serum −skin
I. Before injection	79	18	7	38	16	22.8	8.8	48.1	20.3
After first injection	79	62	4	11	2	78.5	5.0	13.9	2.5
After second injection	79	63	5	10	1	79.7	6.3	12.6	1.2
II. Before injection	79	4	27	14	34	5.0	34.2	17.7	43.0
After first injection	77	50	25	0	2	64.9	32.5	0	2.6
After second injection	79	46	29	3	1	58.2	36.6	3.8	1.3

"+serum" = antibodies present in blood, "−serum" = antibodies absent in blood.
"+skin" = positive skin reaction, "−skin" = negative skin reaction.

It would appear that the results obtained on individuals immunized with polysaccharide antigen are somewhat better than those obtained with whole-cell vaccine for, as seen in table 6, with type I the positive skin tests on individuals with positive serum antibodies comprised 89 percent, with 7.6 percent having positive serum and negative skin reactions. This latter percentage with type I compares satisfactorily with the result of 5 percent with vaccine. With type II, however, 73 percent had positive serum and positive skin reactions, and 22 percent with positive antibody showed no skin reaction, as contrasted with 32 percent in vaccine-treated individuals. Thus, the antigenic

polysaccharide in the dose used is equal, if not somewhat superior, to whole-cell vaccine in the degree of correlation between the skin test and serum antibody content. The problem still remains to be solved as to what modification of skin test antigen may be used to increase the sensitivity of the Francis-Tillett test so that it is possible to separate with a greater degree of accuracy individuals whose serums either do or do not contain protective antibody.

TABLE 6.—*Correlation of skin reaction and serum antibody following injection of polysaccharide antigen*

Type	Total number	Number of persons				Percent			
		+serum +skin	+serum −skin	−serum +skin	−serum −skin	+serum +skin	+serum −skin	−serum +skin	−serum −skin
I. Before injection	92	20	9	45	18	21.7	9.8	48.9	19.6
After injection	92	82	7	3	0	89.1	7.6	3.2	0
II. Before injection	92	7	40	10	35	7.6	43.5	10.9	38.0
After injection	92	67	21	2	2	72.8	22.8	2.2	2.2

"+serum"=antibodies present in blood, "−serum"=antibodies absent in blood.
"+skin"=positive skin reaction, "−skin"=negative skin reaction.

DISCUSSION

The present study provides additional data on the relationship between antigenicity in mice and in man. In a previous report (*7*) on the optimum dose of a polysaccharide antigen in man as measured by protective serum antibody content, the antigen used was of low activity for mice; yet the results were apparently as good as those reported here in which the polysaccharide was one hundredfold more antigenic for mice. In addition, small numbers of individuals have been tested with polysaccharide nonantigenic for mice which apparently caused as good a response as either of these two antigens. This is a confirmation of the results obtained by Francis (*9*) with a polysaccharide rendered inactive for white mice by treatment with alkali. It is difficult to conceive of such a possibility with whole-cell vaccine, that is, an organism nonantigenic for mice yet fully antigenic for man. However, it is general practice in the production of pneumococcus antibody to choose an organism which stimulates the highest antibody titer in the animal species used. Obviously more work must be done to establish, if possible, tests which may insure the use of an active vaccine for human beings in hope of increasing resistance to pneumococcus or other bacterial species. So far as it has been observed by us, polysaccharide antigen either nonantigenic or active for mice is highly antigenic for man. The reverse is not true with the polysaccharide.

Prior to recent studies, little work has been done on the actual measure of antigenicity of pneumococcus vaccine, or, as a matter of fact, any bacterial vaccine, before its use on human beings. It is

apparently believed by many investigators that the injection of the whole bacterial cell will be followed by increased resistance of the host whether or not serum antibodies are developed. Efforts have been made by some to assure activity by taking into consideration the dose, the number of injections, and the interval, and to some extent the antigenicity of the vaccine used. The experiment in the Rand in South Africa, initiated by Sir Almroth Wright, is perhaps the first good example (Lister (*10*)). He used opsonic index as a measure of individual response to a given antigen. The degree of correlation between this index and the amount of protective antibody as a means of increasing resistance in human beings is not known. It is of importance to quote the conclusion of Lister in regard to response as measured by opsonic titer following repeated injections of their pneumococcus vaccine: "Antibody formation is greatly increased after a second inoculation and rises to a still higher degree after a third inoculation."

More recently, Cecil and Austin (*11*) reported an evaluation of vaccine in 42 human beings, prior to immunization of a large group, by injecting repeated doses of different amounts. In all they reported tests on 42 individuals, 32 with doses varying from 34 billion of each type to 2.5 billion organisms, at intervals varying from 1 to 7 days, with the number of injections varying from 2 to 7. Since it has been demonstrated by us that there is a very great individual variation in capacity to manufacture antibody, it is doubtful whether with the small number of individuals studied a significant conclusion may be drawn from their report. It is of interest to summarize their results according to the number of individuals whose serums protected against 0, 100, 1,000, and 10,000 lethal doses. With type I, 7 failed to respond, 10 protected against 100, 13 against 1,000, and 2 against 10,000 lethal doses; with type II, 4 failed to respond, 10 protected against 100, 16 against 1,000, and 2 against 10,000; with type III, 26 failed to respond, 4 responded against 100, and 2 against 1,000 lethal doses. In comparison with work reported above, the antigen used by them in very large doses and with repeated injections gave a response inferior to that from a single injection of 250 million organisms each of types I and II. These investigators also injected 8 individuals with a single dose of 8 billion organisms of each type, I, II, and III; 2 failed to respond to type I and 5 to type III; all the others responded but with the highest titer protection by 0.2 cc. serum against 1,000 lethal doses. It is possible that had all the 32 received this dose, the same antibody response would have resulted as from the multiple massive doses. From our experience, their antigen was not ideally antigenic, and yet the outcome of the experiment with 12,519 men, in whom repeated injections were made of 9 billion organisms of each type, was most promising for no cases of types I, II, or III pneumonia occurred in the 10-week observation period. There were 26 cases of

these types in the control group of about 20,000. This brings up the question as to whether or not increased resistance might be associated with some form of response other than serum protective antibody.

Two other examples are given in which serum antibodies were tested after repeated injections of vaccine in human beings. The first is the one of Barach (*12*) in which five human donors were used in a study of the effect of blood from immunized individuals in the treatment of pneumonia. In one study, he injected five individuals weekly with doses of vaccine varying from 1 to 25 billion organisms over different periods, two persons for 12 months, the others for 5 months, 7 months, and 6 weeks, respectively. Antibody titer varied with the individual, but even after long-continued injection of vaccine there was no indication of hyperimmunity. The highest titer found was such that 0.2 cc. of serum protected mice against 100,000 lethal doses. This titer was no higher than the average recorded above following a single injection of a small dose of whole-cell vaccine. One individual, after repeated vaccinations for 12 months, had no types I or II, and very little type III antibodies.

A third example is Ferguson's (*13*) study on three individuals after four or five repeated injections of serum antibody, irregularly spaced from 4 to 7 days. The dose varied from 50 to 200 million type I organisms. Serum was tested a month after the last injection and again in six other titrations over a period of a year. Serums from all three individuals had higher titer of antibody than reported by Cecil and Austin or Barach. However, again the serum antibody content was no higher than in many of the individuals reported in this paper after a single injection of vaccine.

Although it has been observed that the appearance of detectable antibody occurs in from 3 to 5 days after injection of the polysaccharide antigen, a 14-day interval has been chosen because it was found that in most individuals the concentration of serum antibody was then maximum and afterwards remained constant for a period of months. In the work of Cecil and Austin, and also Barach, the time for testing was approximately a week after the last injection of vaccine. Also in Ross' work (*14*) on oral immunization with pneumonia vaccine the interval of tests for serum antibody varied from 1 day to 27 days after the last feeding. In addition, with polysaccharide antigen, Francis (*9*) made tests a week after, and Finland (*15*) a week or more after injection of the antigen. This may account in part for the relatively low titer of the serum, for it has often been found that serum antibody increased between the first and second week from twofold to tenfold in titer. Because of this variation in lapse of time between injection and titration of serum, it is impossible to compare the results of different investigators on a common basis.

In the comparison between the relative activity of polysaccharide and vaccine in this study, the group tested is small; yet it would appear that there is no significant difference. Consequently, inasmuch as injections consisted of 400 to 800 mouse immunizing units of polysaccharide antigen types I and II, and only 50 and 100 of the whole-cell vaccine, it would appear that in human beings the whole-cell vaccine is more antigenic by weight than is the case with polysaccharide. Nevertheless, since an antigenic dose of polysaccharide can be injected without production of untoward reaction, in contrast to whole-cell vaccine, if any pneumococcus antigen is to be used in attempts to increase resistance of human beings to pneumococcus infection, the polysaccharide is at present the one of choice. It may be possible to isolate from the pneumococcus cell an antigen that is as active for humans as the whole cell without producing local or systemic reactions. Both polysaccharide antigen and vaccine stimulate serum antibody, being apparently alike in titer and showing similar individual variation in capacity to produce antibody. Whether or not the whole-cell vaccine is superior to polysaccharide in increasing the resistance of the host against the pneumococcus in a manner different from the polysaccharide is purely speculative and awaits proof.

There is apparently no difference between the two antigens as measured by the effect of a second dose (7). Evidently hyperimmunity in the human being, at least by the present methods and with present antigens, is difficult to obtain as measured by the titer of serum antibodies. In this experiment the second injection of vaccine 14 days after the first, did not significantly increase serum antibody content even though the dose was doubled in the second injection. The interval of injection may have been incorrect or the antigen may have been at fault. So far the polysaccharide antigen and the whole-cell vaccine give like results as to individual variation in response and as to their relative ability to stimulate antipneumococcal immunity in man. If this individual variation represents varying degrees of susceptibility to pneumococcus infection, active immunity will be successful only when and if methods are devised to stimulate antibody alike in all individuals.

SUMMARY

Comparison was made between the antigenicity of polyvalent whole-cell vaccine of pneumococci types I and II in 79 persons and polyvalent polysaccharide antigen types I and II in 92 individuals. Vaccine was used in two doses, 225 million organisms of each type for the first and 450 million for the second. With polysaccharide antigen one dose was used containing 0.4 mg. type I and 0.2 mg. type

II. The relative activity was measured by the serum protective antibody titer and the skin test of Francis and Tillett. The results are as follows:

1. There was no significant difference found with respect to the protective titer of the serum, the individual variation in response, and the percentage of individuals who did not have detectable antibody in the blood.

2. With the doses of vaccine used at a 14-day interval between injections, there was no advantage in respect to antibody titer in the second injection.

3. The skin test was positive after immunization with vaccine when there were serum antibodies present for type I in 78.5 percent of the group, type II in 64.9 percent; with polysaccharide antigen, for type I in 89 percent and type II in 72 percent.

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OBSERVATIONS ON HOUSEHOLD ANOPHELISM IN A SELECTED GROUP OF MOSQUITO-PROOFED AND NON-MOSQUITO-PROOFED HOMES [1]

By REDGINAL HEWITT and EMIL KOTCHER

The studies described herein deal principally with data obtained during June, July, and August 1940, from the Wheeler Reservoir Area of the Tennessee Valley Authority near Decatur, Ala. Three communities in this area have been under observation during the mosquito-breeding season since the summer of 1938, and records have been kept of the amount of malaria which occurs in the region (*5*, *6*). A mosquito-proofing program was started in two of these communities in the spring of 1938 and was completed in April 1939; the houses in the third community are not mosquito-proofed. The approximate population included in the experimental areas is as follows:

Community	*Number of houses*	*Population*
Harris Station [2]	210	1, 100
Cotaco Creek [2]	150	700
Buckeye Swamp [3]	180	800

It was considered desirable to determine to what extent the mosquito-proofed houses are protected against the entrance of female *Anopheles quadrimaculatus* as compared with the unscreened houses. The results of studies on household anophelism in the three communities cited form the subject of the present report.

METHODS

The three types of data obtained throughout the period of observation are:

(*a*) *Observations on household anophelism in a selected group of houses.*—Twelve houses in Harris Station, 11 houses in Cotaco Creek, and 15 houses in Buckeye Swamp were selected for study. The houses chosen were scattered throughout the communities, and in most cases were not less than one-third mile or more than one-half mile from a major anopheline breeding site. For the most part they were one-story tenant houses of reasonably comparable construction. No home selected had more than 3 bedrooms, and not less than 4 nor more than 8 people lived in any of them. Most of the houses were comparable from the standpoint of number of surrounding outbuildings and kinds of livestock kept within them.

On Monday, Tuesday, and Wednesday of each week at approximately the same time of day from June 1 to August 31, visits were

[1] From the Health and Safety Department, Tennessee Valley Authority, Wilson Dam, Ala.
[2] Houses mosquito-proofed.
[3] Houses not mosquito-proofed.

made to all houses selected. A search was made for resting *Anopheles quadrimaculatus* in bedrooms, although in several cases storerooms and kitchens which were found to provide suitable resting places were also examined. The corners of rooms, ceilings, baseboards, and backboards of stationary furniture were the points searched particularly. All mosquitoes counted on each day were killed in their resting places with a mixture of pyrethrum in an aromatic oil base. The purpose of killing all mosquitoes counted was to insure that counts made on Tuesday and Wednesday would not include mosquitoes which might have remained in the houses from the previous day.

(*b*) *Observations on the length of time that female A. quadrimaculatus remain within mosquito-proofed and nonmosquito-proofed dwellings.*—The total counts from each of the above houses were assembled for day 1 (Monday), day 2 (Tuesday), and day 3 (Wednesday) throughout the entire month. These totals were divided by the total number of visits made to the houses in each community during the month on the particular day designated; the figures obtained represent the average number of mosquitoes counted on day 1, day 2, and day 3.

A second method directed to ascertain the length of stay of *A. quadrimaculatus* consisted of staining mosquitoes with 1 percent aqueous solutions of methylene blue and eosin-Y and releasing them in mosquito-proofed and nonmosquito-proofed houses. Catches were made on various days thereafter to determine how many of the stained mosquitoes remained in the houses.

(*c*) *Observations on the flight of mosquitoes between barns and houses.*—Stained mosquitoes were released in houses and barns not more than 75 yards apart, and catches made in both buildings on various days thereafter were tested for the presence of stain with 70 percent alcohol (tests on laboratory-stained mosquitoes proved this to be an effective method for determining the presence of stain). Aqueous methylene blue was used to stain mosquitoes released in houses, and eosin-Y in barns.

RESULTS

(*a*) *Household anophelism.*—In table 1 data are presented which show the total number of mosquitoes captured per month in houses in the three communities studied, as well as the average count of mosquitoes per house per day during the month. Throughout the month of June there was little variation between the number of mosquitoes found in the mosquito-proofed and nonmosquito-proofed houses. Comparable counts were made in all houses visited and these were for the most part exceedingly low. In July, however, considerable variation occurred between the counts made in the three communities. In Harris Station, an average number of 5.67 mosquitoes per house per day was found, but in Cotaco Creek only 2.15 mosquitoes

per house per day were counted. Buckeye Swamp showed a significantly higher daily average (8.03 mosquitoes per house per day) than did Cotaco Creek, but only slightly higher than Harris Station. The daily average count for the month of August was highest in the nonmosquito-proofed houses.

TABLE 1.—*Anopheline density in houses, 1940*

Area	Monthly total			Number of observations			Average number of mosquitoes per house per day		
	June	July	August	June	July	August	June	July	August
Harris	128	971	233	135	171	137	0.94	5.67	1.70
Cotaco	140	326	180	129	151	127	1.08	2 15	1 41
Buckeye [1]	220	1,551	1,090	168	193	172	1.25	8.03	6.33

[1] Houses not mosquito-proofed.

It should be noted that in one house in Harris Station during the month of July the total number of mosquitoes counted was 315.

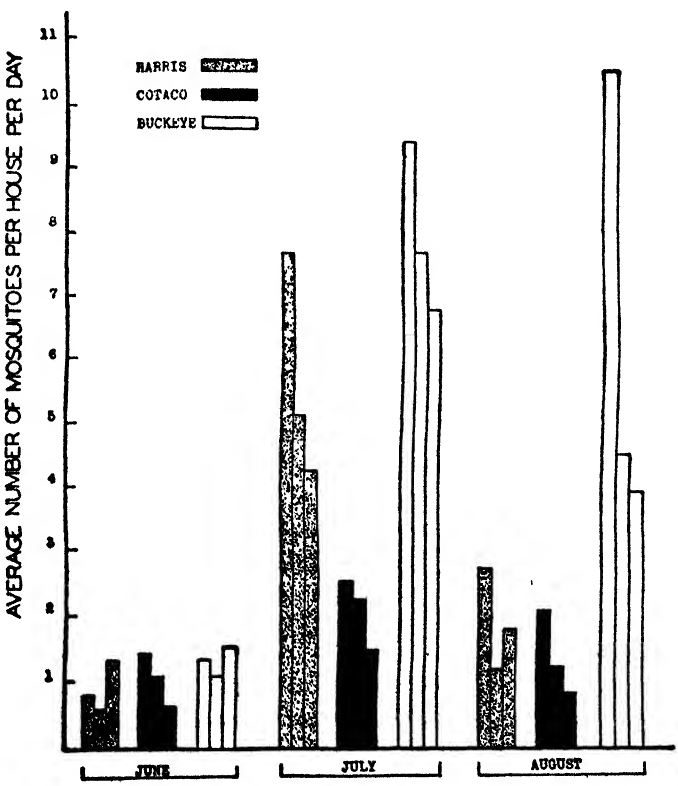

FIGURE 1.—Average number of mosquitoes per house per day in the three communities studied during June, July, and August 1940. The average counts from each community are given for Monday, Tuesday, and Wednesday of each week. The houses in Harris and Cotaco were screened; those in Buckeye were not screened.

In another the total count was 278, and in a third, 120. Thus the average count per house per day, 5.67, is weighed heavily by the findings in 3 dwellings. All of the counts in the other 9 houses were markedly lower than any of the above mentioned, and the combined total of these 9 houses for July was only 256. Similar but less pronounced variations occurred in the other two areas studied, particularly in Buckeye Swamp. No explanation can be given for this occurrence on the basis of known facts.

(*b*) *The length of time that female A. quadrimaculatus remain within mosquito-proofed and nonmosquito-proofed houses.*—The average numbers of mosquitoes captured per house per day during the months of June, July, and August are shown in figure 1. These are arranged in the order that counts were made, on Monday (day 1), Tuesday (day 2), and Wednesday (day 3) of each week. Very little significance can be attached to the differences in the number of mosquitoes found on each of these days throughout the month of June, since the variation is exceedingly small. During the month of July, however, the average number of mosquitoes found on Monday of each week in Harris Station and Buckeye Swamp was markedly higher than the counts made on Tuesday and Wednesday in the same houses. This is not strikingly shown in Cotaco Creek, since household anophelism remained at a low level in this community throughout the entire period of observation. Likewise, throughout the month of August the data show that a marked diminution occurred in the number of mosquitoes found in houses on the second and third days of each weekly visit, as compared with the first day, in both mosquito-proofed and nonmosquito-proofed houses. This seems to indicate that over a period of 1 or 2 days mosquitoes which enter houses have a tendency to accumulate in them.

A very small percentage of stained mosquitoes released in houses were recovered on following days thereafter, as shown in table 2. In series 1, for example, out of 244 stained mosquitoes released in 5 different houses, only 2 were recovered on the following day. Considering the relatively large number of mosquitoes that were released, the total number recovered on any particular day thereafter was remarkably small, and it appears that under the conditions of the series of experiments performed, most fed female *A. quadrimaculatus* do not remain within either mosquito-proofed or nonmosquito-proofed homes for long periods of time.

Out of 505 newly emerged mosquitoes [4] (about 50 percent females) released in 8 mosquito-proofed houses at different times during the day only 4 were recovered on the following morning (table 3). Only one recovery was made from a nonmosquito-proofed house.

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[4] Obtained from the insectary at Wilson Dam.

(c) *The flight of mosquitoes between barns and houses.*—A total of 3,575 mosquitoes was released in 5 different barns, and only 28 of these were recovered from the same barns on the first, second, and third days thereafter. No instance of flight from barn to house was found, and only 8 instances of flight from house to barn were discovered (a total of 1,493 mosquitoes was released in houses within 75 yards of the above-mentioned barns).

TABLE 2.—*Number of A. quadrimaculatus recovered from screened and unscreened houses on various days following their release*

Number of houses included in observations	Total number of stained mosquitoes released	Total number of mosquitoes captured on days indicated							
		Total				Stained			
		1	2	3	4	1	2	3	4
Mosquito-proofed:									
5	244	15	[1]	[1]	[1]	2	[1]	[1]	[1]
5	417	109	87	[1]	[1]	24	15	[1]	[1]
5	271	56	67	[1]	[1]	7	1	[1]	[1]
5	230	[1]	26	56	[1]	0	1	1	[1]
5	395	[1]	[1]	[1]	41	[1]	[1]	[1]	0
Not mosquito-proofed:									
2	125	87	[1]	[1]	[1]	5	[1]	[1]	[1]
3	180	19	7	[1]	[1]	0	0	[1]	[1]
2	185	[1]	[1]	[1]	5	[1]	[1]	[1]	1

[1] Houses not searched on these days.

TABLE 3.—*Number of A. quadrimaculatus recovered from screened and unscreened houses on the day following the release of unfed, newly emerged females and males*

House number	Number of stained mosquitoes released	Time of release	Number of mosquitoes captured on following morning	
			Total	Stained
Mosquito-proofed:				
154	50	8:00 a. m.	None seen	
204-1	50	8:10 a. m.	None seen	
120	70	9:00 a. m.	9	[1] 1
44	30	9:20 a. m.	8	[1] 1
176-3	30	2:00 p. m.	3	0
178-1	100	2:00 p. m.	38	[2] 2
254	100	3:45 p. m.	11	0
154	75	7:15 p. m.	2	0
Total	505		71	4
Not mosquito-proofed:				
284-1	125	3:15 p. m.	30	0
389	100	7:30 p. m.	7	[3] 1
Total	225		37	1

[1] Fed female.
[2] 1 fed and 1 unfed female.
[3] Unfed female.

DISCUSSION

The data obtained from 3 successive visits each week to a selected group of mosquito-proofed and nonmosquito-proofed houses, as shown in figure 1, indicate that an accumulation of mosquitoes probably occurred in the houses for one or two days preceding the first

weekly visit, particularly during July and August. This accumulation was not as great as would be expected over a 5-day period if none of the mosquitoes which entered the houses left them soon after a blood meal was taken. Moreover, the presence of screens seemed to have no influence on the degree of accumulation, since an equal and more often greater accumulation occurred in nonmosquito-proofed houses.

In view of the large numbers of stained mosquitoes released in houses, remarkably few were recovered, and none were found beyond 4 days from the time of their release. The recoveries made in mosquito-proofed houses were not appreciably higher than those recaptured from nonmosquito-proofed homes, considering the proportionate number of mosquitoes released in each case. Barber and Hayne (*1*) make the following statement relative to this subject: "Our results indicate that *A. quadrimaculatus*, even in the case of females engorged with blood, do not under natural conditions remain long in a resting place; further, that they soon die when confined in such resting places, even when supplied with a source of blood." Darling (*2*), in reviewing contemporary entomological research in malaria, stated that observations show that *A. quadrimaculatus* may remain but a day or two within a habitation after taking a blood meal; they then leave the home for another resting place.

Frequently, during the present observations, the tenants claimed that they killed many mosquitoes in the early morning on the inside of screened doors or windows. This procedure seemed to be a common one in the areas visited and it is inferred that after securing a blood meal the mosquitoes seek a means of egress and come to rest on the screens. Those which do not escape, or are not killed, seek the darkest places in the house after daybreak, where they rest during the day (*4*).

Mosquitoes found in barns during the daytime were almost invariably fed females, most of which had probably taken their blood meals from livestock kept in the barn the preceding night. Very few mosquitoes released in barns were recovered from the same barns at any time thereafter, although it was not possible to make "total" catches on the days that recapture was attempted. A sufficient sample (from one-third to one-half the estimated total number within barns) was obtained in every case, however, to show that most of the stained mosquitoes had left the barns within 1 or 2 days from the time of their release. Newly emerged females behaved similarly in this respect. Roubaud (*3*), and Barber and Hayne (*1*) hold similar opinions relative to the quick "turn-over" of mosquito populations in their resting places. The former author was unable to recover any *A. maculipennis* which were stained in a barn 6 days previously, and experiments by the latter investigators indicated that

even though anophelines were destroyed or removed from their daytime resting places, the number found on succeeding days thereafter was as large as ever.

SUMMARY

Studies on household anophelism were made from June through August in a selected group of 38 houses surrounding Wheeler Reservoir, near Decatur, Ala. The houses chosen for observation were approximately comparable with respect to construction, size, number of occupants, number of bedrooms, number of outbuildings, livestock, and distance from anopheline breeding sites. Visits were made to these houses on Monday, Tuesday, and Wednesday of each week at approximately the same time of day. Resting female *A. quadrimaculatus* were counted and killed in their resting places. Although considerable variation occurred within different houses, in general throughout the period of observation fewer mosquitoes were found in mosquito-proofed homes than in houses not so protected.

A certain amount of accumulation of mosquitoes was demonstrated during the 5-day period preceding the first weekly visit, but this was no more evident in screened than unscreened houses. Likewise, the results obtained from staining and releasing mosquitoes in houses, with recovery on various days thereafter, did not show that the presence of screens reduced the number of mosquitoes which were able to leave the house once they had entered. Very few mosquitoes were recovered from houses or barns following their release, and little interflight occurred between barns and houses 75 yards apart.

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EFFECTIVENESS OF DERATIZATION OF SHIPS BY TRAPPING

By G. C. Sherrard, *Acting Assistant Surgeon*, and C. J. Vion, *Senior Clerk*, *United States Public Health Service*

As a means of reducing the rat population on infested ships, trapping has been productive of excellent results at the Port of New York. During the past 3 years this activity has been made a respon-

sibility of the vessels concerned, with the Public Health Service exercising general supervision through frequent inspections and recommendations. The actual trapping has been accomplished in most part by members of each ship's crew. However, in some instances private exterminators have been employed during the vessel's stay in port.

While the examples of the effectiveness of trapping herein presented have been chosen on account of the rather spectacular results obtained, no less satisfactory accomplishments have been obtained on a very much larger number of vessels with only slight or moderate infestation. On these vessels, by persistent and continuous application of sanitary procedures in conjunction with trapping, the rat population has either been eliminated or reduced to a negligible number.

From the large number of vessels engaged in foreign trade and calling at New York, the accompanying list of 20 vessels has been chosen to illustrate the possibility of accomplishing satisfactory deratization by means of careful trapping.

TABLE 1.—*Estimated number of rats present on 20 selected vessels engaged in foreign trade and number of rats trapped under the direction of the Public Health Service at the Port of New York*

Nationality	Vessel	Net tonnage	Number of rats estimated	Number of traps set	Number of rats recovered	Number of days trapped	Remarks
Greek	S. S. A. M	2,476	21	36	17	3	Trapping in progress at sailing time.
British	S. S. A	4,077	15	24	11	6	Do.
Greek	S. S. A	1,791	8	14	21	42	Do.
British	S. S. D	2,802	15	24	15	4	Do.
Japanese	S. S. D. M	4,383	12	20	22	6	Trapping in progress at sailing time. Final estimate 5.
Norwegian	S. S. E. S	3,533	33	36	28	16	Trapping in progress at sailing time.
Finnish	S. S. I. R	1,314	15	24	17	25	None trapped last 4 days.
British	S. S. K	2,426	10	----	9	6	
British	S. S. K. I	3,164	14	24	37	3	Trapping in progress at sailing time.
Norwegian	M. V. L	1,886	26	36	40	5	Do.
Portuguese	S. S. L. M	3,857	8	24	35	8	Do.
Polish	S. S. M. W	1,911	12	41	51	8	Trapped 20 on voyage. Final inspection negative.
Greek	S. S. M. R	3,192	16	---	27	5	Trapping in progress at sailing time.
Greek	S. S. N	2,989	14	24	12	6	
Norwegian	S. S. N	3,143	15	27	46	9	Final inspection negative.
Belgian	S. S. P	3,293	15	24	15	3	Trapping in progress at sailing time.
Norwegian	S. S. S	2,460	16	24	11	5	Do.
Egyptian	S. S. S	1,842	25	42	30	4	
Norwegian	M. V. T. Y	3,806	14	36	71	12	
British	S. S. W. W	2,627	11	24	13	8	Do.
Totals	20	-------	315	----	528	----	

Average number of traps set on 18 vessels: 28.
Average number of days traps were set: 9.2.

The actual number of rats trapped is probably greater than the report indicates as only the dead rats actually collected by sanitary inspectors have been counted. It frequently happens that longshoremen or members of the ship's crew throw the bodies overboard

before they can be collected by a designated crew member or the sanitary inspector. On the other hand, the number of rats estimated is frequently less than the number actually present on board. This is due in many cases to the fact that the vessels are fully loaded with inbound cargo at the time of the inspection and only the rat evidence on the top of the cargo can be seen.

During the 12-month period ended February 1, 1941, 2,910 rats were recovered as a result of trapping operations on vessels entering the Port of New York. This did not include a considerable, but unverified, number reported trapped at sea.

As none of the rats included in the present account were trapped by employees of the United States Public Health Service, it will be seen that the results represent commendable cooperation on the part of the ship's crew.

To obtain satisfactory results from trapping, a considerable expenditure of effort is required in educating designated members of crews of infested vessels. At the Port of New York this is mostly accomplished by instruction imparted by sanitary inspectors to the personnel of vessels and also by the distribution of printed instructions on trapping [1] to chief officers and others concerned.

In this connection it is desired to emphasize the general importance of ship sanitation, including elimination of rat harborages and of waste food products as a necessary adjunct to deratization by trapping. Hunger resulting from deprivation of the customary food supply, and the disturbance of rats' harboring and nesting places by the application of appropriate sanitary measures greatly increase the effectiveness of trapping.

From our experience we conclude that supervised trapping on infested vessels, from the first United States port of call until the vessel is completely deratized or sails for a foreign port, is producing effective results.

DEATHS DURING WEEK ENDED MAY 3, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 3, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,282	8,459
Average for 3 prior years	8,238	
Total deaths, first 18 weeks of year	166,242	166,714
Deaths per 1,000 population, first 18 weeks of year, annual rate	12.9	12.9
Deaths under 1 year of age	477	496
Average for 3 prior years	502	
Deaths under 1 year of age, first 18 weeks of year	9,620	9,198
Data from industrial insurance companies:		
Policies in force	64,542,842	65,021,263
Number of death claims	12,336	12,312
Death claims per 1,000 policies in force, annual rate	10.0	9.8
Death claims per 1,000 policies, first 18 weeks of year, annual rate	10.6	10.6

[1] Trapping rats on ships. Pub. Health Rep., 55: 1057-1061 (June 14, 1940). (Reprint No. 2170.)

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 10, 1941

Summary

The number of reported cases of measles dropped to 39,754 as compared with 43,880 for the preceding week, making the third successive week in which a decreased incidence has been reported. The total number of cases reported to date (first 19 weeks), 623,017, now exceeds the number reported for the corresponding period of any other year since 1919 and is possibly higher than the figure for any prior year for which corresponding reports are available.

A total of 22 cases of poliomyelitis was reported, as compared with 20 for the preceding week, with 14 in 1940, and with a 5-year (1936–40) median of 19. During the corresponding week of the 5 preceding years the current incidence was exceeded only in 1939. For the current week 6 cases were reported in Florida and 3 cases each in New York State and California. Of 446 cases reported to date this year, 110 cases have been reported in the South Atlantic area, 52 cases in Florida of which 36 occurred in Dade County.

In addition to measles, the cumulative totals for influenza and poliomyelitis are above the 5-year median expectancy and for whooping cough higher than for any year since 1937.

One case of psittacosis was reported in Chester County, Pennsylvania, and one plague-infected ground squirrel was reported found in Kern County, California.

Three cases of tularemia, 17 cases of Rocky Mountain spotted fever, and 27 cases of endemic typhus fever were reported.

The death rate for the current week (annual basis) in 88 major cities was 11.6 per 1,000 population, the same as for each of the two preceding weeks and slightly below the 3-year (1938–40) average of 11.7. The cumulative rate for the first 19 weeks (annual basis) is 12.8, as compared with 12.9 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended May 10, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940	
NEW ENG.												
Maine	1	0	1	1	1	1	51	454	134	1	0	0
New Hampshire	0	0	0	2	------	------	48	38	38	0	0	0
Vermont	3	0	0	------	------	------	66	12	142	0	0	0
Massachusetts	4	4	4	------	------	------	848	713	703	5	1	1
Rhode Island	0	0	0	------	------	------	8	159	76	0	0	0
Connecticut	1	2	5	------	1	1	422	54	249	1	0	0
MID. ATL.												
New York [1]	20	23	38	[2] 5	[2] 16	[2] 8	4,257	945	2,320	7	6	6
New Jersey	3	6	9	10	5	5	2,527	759	759	1	0	0
Pennsylvania [3]	13	20	21	------	------	------	5,534	417	1,114	1	4	4
E. NO. CEN.												
Ohio	6	17	17	10	44	44	4,017	22	333	1	1	2
Indiana	13	1	7	1	6	8	1,026	22	23	1	0	0
Illinois	30	17	32	------	7	21	2,013	198	198	3	1	3
Michigan [4]	4	3	8	11	7	5	3,027	661	481	2	0	1
Wisconsin	0	2	2	30	65	37	1,800	776	776	0	0	0
W. NO. CEN.												
Minnesota	4	1	2	------	2	2	31	135	239	2	0	1
Iowa	0	3	3	17	------	3	246	260	147	0	0	0
Missouri	1	12	12	6	2	15	569	24	39	0	2	2
North Dakota	0	0	1	1	6	15	21	5	5	0	0	0
South Dakota [5]	1	1	1	1	1	------	10	1	1	0	0	0
Nebraska	0	1	2	------	------	------	35	23	23	0	0	0
Kansas	9	6	6	7	3	3	905	509	83	0	2	2
SO. ATL.												
Delaware	0	0	1	------	------	------	98	0	19	0	0	0
Maryland [4,5]	2	0	2	5	2	5	356	5	241	5	0	2
Dist. of Col	1	4	4	1	------	------	257	5	104	0	0	0
Virginia [1]	4	9	9	243	114	114	1,656	298	353	4	3	3
West Virginia [4]	5	4	4	14	20	23	777	88	76	1	3	3
North Carolina [1]	8	5	12	1	------	6	1,688	227	237	2	1	2
South Carolina [1]	4	2	6	213	303	142	595	38	74	0	0	1
Georgia [1]	3	4	5	35	56	------	470	144	74	0	1	1
Florida [1]	0	1	8	11	1	4	547	166	137	0	0	1
E. SO. CEN.												
Kentucky	5	4	7	8	12	9	875	120	120	3	12	9
Tennessee [1]	3	2	6	35	42	77	685	181	105	3	2	3
Alabama [1]	6	3	7	57	47	47	391	103	103	0	0	2
Mississippi [1,4]	9	5	5	------	------	------	------	------	------	2	2	0
W. SO. CEN.												
Arkansas	2	8	6	21	46	50	301	120	55	2	0	0
Louisiana	1	3	9	6	3	8	43	11	13	1	0	2
Oklahoma	6	5	5	47	40	40	190	13	60	1	0	0
Texas [1]	18	26	27	511	335	335	1,456	1,574	506	0	3	3
MOUNTAIN												
Montana [5]	1	2	2	4	31	2	35	57	42	0	0	0
Idaho	1	0	0	------	------	6	28	33	33	0	1	0
Wyoming [5]	0	0	1	------	1	------	80	14	19	0	0	0
Colorado	9	3	6	23	4	------	526	47	47	0	1	1
New Mexico	0	0	1	1	11	6	272	63	38	0	0	0
Arizona	2	1	1	55	73	39	78	73	66	0	0	0
Utah [4,5]	0	0	0	6	3	------	64	635	86	1	0	0
Nevada	0	------	------	23	------	------	105	------	------	0	------	------
PACIFIC												
Washington	0	0	1	------	1	------	42	659	330	1	0	0
Oregon	3	5	4	7	12	18	266	572	67	0	0	0
California	7	17	23	29	63	63	412	373	640	2	0	3
Total	213	227	381	1,458	1,386	1,386	39,754	11,806	13,568	53	46	62
19 weeks	5,258	6,412	9,258	586,072	162,162	143,546	623,017	139,147	181,394	939	784	1,542

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 10, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940	
NEW ENG.												
Maine	0	0	0	12	9	9	0	0	0	0	0	0
New Hampshire	0	0	0	6	1	5	0	0	0	0	0	0
Vermont	0	0	0	3	4	7	0	0	0	0	0	0
Massachusetts	0	0	0	183	153	233	0	0	0	4	4	1
Rhode Island	0	0	0	18	8	13	0	0	0	0	0	0
Connecticut	0	0	0	67	106	106	0	0	0	2	2	1
MID. ATL.												
New York [1]	3	0	0	480	1,091	904	0	0	0	5	6	7
New Jersey	1	0	0	287	449	261	0	0	0	1	2	2
Pennsylvania [3]	1	1	1	402	467	381	0	0	0	4	7	7
E. NO. CEN.												
Ohio	0	0	0	297	380	371	0	0	0	3	4	4
Indiana	0	0	0	82	107	129	1	1	21	3	0	1
Illinois	0	1	1	340	676	575	4	2	18	5	2	3
Michigan [4]	0	0	1	263	335	350	5	2	2	0	1	2
Wisconsin	0	1	0	98	131	146	7	1	4	0	2	1
W. NO. CEN.												
Minnesota	0	0	0	39	56	149	0	1	7	0	1	2
Iowa	0	0	0	27	61	91	9	13	31	0	1	2
Missouri	0	0	0	138	65	65	1	7	7	1	1	1
North Dakota	0	0	0	5	2	23	3	2	5	2	0	0
South Dakota [5]	0	0	0	15	7	16	0	1	5	0	0	0
Nebraska	0	0	0	12	24	47	0	4	6	0	0	0
Kansas	0	1	0	42	55	83	2	0	9	1	3	1
SO. ATL.												
Delaware	0	0	0	15	5	3	0	0	0	0	0	0
Maryland [4] [5]	1	0	0	51	28	33	0	0	0	2	1	2
Dist. of Col.	0	0	0	5	47	17	0	0	0	0	0	0
Virginia [1]	0	0	0	41	30	21	0	0	0	3	4	4
West Virginia [4]	0	2	0	46	27	30	0	0	0	9	2	3
North Carolina [1]	0	0	1	9	20	22	0	0	0	0	2	3
South Carolina [1]	0	1	0	5	3	3	0	1	0	5	2	3
Georgia [1]	0	1	1	19	11	7	0	0	0	4	3	5
Florida [1]	6	0	0	1	6	7	0	0	0	12	1	4
E. SO. CEN.												
Kentucky	0	0	0	98	76	46	0	0	1	4	8	4
Tennessee [1]	1	0	0	66	55	20	0	0	0	7	0	8
Alabama [1]	0	0	1	15	8	6	0	0	0	1	5	5
Mississippi [1] [4]	2	0	1	1	3	5	0	0	0	3	1	2
W. SO. CEN.												
Arkansas	0	0	0	6	18	8	0	0	1	2	6	3
Louisiana	1	0	0	3	5	10	0	0	0	1	1	9
Oklahoma	1	0	0	19	15	21	0	1	1	2	1	2
Texas [1]	1	1	1	57	24	63	5	2	5	6	9	9
MOUNTAIN												
Montana [5]	0	0	0	18	21	21	0	0	8	0	2	1
Idaho	0	0	0	6	5	9	0	0	1	1	1	0
Wyoming [5]	0	0	0	9	14	7	0	0	0	0	0	0
Colorado	0	0	0	25	34	47	0	7	7	2	1	1
New Mexico	0	0	0	6	4	21	0	0	0	0	0	1
Arizona	0	0	0	2	15	15	0	0	0	0	2	2
Utah [4] [5]	0	0	0	11	16	21	0	1	1	1	0	0
Nevada	0	------	------	2	------	------	0	------	------	1	------	------
PACIFIC												
Washington	0	0	0	11	55	88	0	1	6	3	2	2
Oregon	1	0	0	8	17	21	0	0	19	2	0	1
California	3	5	3	117	143	177	0	1	4	4	9	9
Total	22	14	19	3,488	4,887	4,887	37	48	272	106	99	129
19 weeks	446	441	375	70,248	91,674	109,464	858	1,380	5,987	1,481	1,560	2,119

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 10, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— May 10, 1941	Whooping cough, Week ended— May 11, 1940	Division and State	Whooping cough, Week ended— May 10, 1941	Whooping cough, Week ended— May 11, 1940
NEW ENG.			**SO. ATL.—continued**		
Maine	30	8	Georgia [1]	28	21
New Hampshire	114	32	Florida [1]	9	11
Vermont	17	37	**E. SO. CEN.**		
Massachusetts	215	179	Kentucky	59	78
Rhode Island	15	4	Tennessee [1]	64	62
Connecticut	51	27	Alabama [1]	51	18
MID ATL.			Mississippi [4]		
New York [1]	289	346	**W. SO. CEN.**		
New Jersey	105	114	Arkansas	50	19
Pennsylvania [3]	362	313	Louisiana	36	31
E. NO. CEN.			Oklahoma	42	8
Ohio	388	218	Texas [1]	429	344
Indiana	36	26	**MOUNTAIN**		
Illinois	99	95	Montana [5]	17	1
Michigan [4]	420	199	Idaho	31	20
Wisconsin	134	94	Wyoming [5]	1	6
W. NO. CEN.			Colorado	189	16
Minnesota	130	36	New Mexico	23	62
Iowa	65	26	Arizona	28	38
Missouri	55	44	Utah [4] [5]	50	190
North Dakota	33	11	Nevada	10	
South Dakota [5]	31	0	**PACIFIC**		
Nebraska	7	16	Washington	169	49
Kansas	129	39	Oregon	8	29
SO. ATL.			California	726	479
Delaware	1	1	Total	5,454	3,754
Maryland [4] [5]	102	125	19 weeks	85,488	58,956
Dist. of Col.	20	12			
Virginia [1]	90	48			
West Virginia [4]	48	85			
North Carolina [1]	300	109			
South Carolina [1]	148	23			

[1] Typhus fever, week ended May 10, 1941, 27 cases, as follows: New York, 3, Virginia, 2; North Carolina, 1; South Carolina, 1; Georgia, 3; Florida, 5; Tennessee, 1; Alabama, 6; Mississippi, 1; Texas, 4.
[2] New York City only.
[3] Psittacosis, week ended May 10, 1941, Pennsylvania, Chester County, 1 case.
[4] Period ended earlier than Saturday.
[5] Rocky Mountain spotted fever, week ended May 10, 1941, 17 cases, as follows: South Dakota, 2; Maryland, 3; Montana, 7; Wyoming, 3; Utah 2.

PLAGUE INFECTION IN GROUND SQUIRREL IN KERN COUNTY, CALIF.

Under date of May 7, 1941, Dr. Harlan L. Wynns, of the California Department of Public Health, reported plague infection proved by animal inoculation in a ground squirrel, *C. beecheyi*, submitted to the laboratory on April 29, 1941, from a ranch 7 miles south and 5 miles west of Techachapi, Kern County, Calif.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 26, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	115	157	57	5,175	614	2,044	19	388	22	1,226	-------
Current week [1]	63	851	27	14,392	359	1,293	1	370	14	1,399	-------
Maine:											
Portland	0	------	0	5	4	1	0	0	0	1	34
New Hampshire:											
Concord	0	------	0	0	1	0	0	0	0	0	8
Manchester	0	------	0	0	1	0	0	0	0	0	16
Nashua	0	------	0	0	0	0	0	0	0	7	5
Vermont:											
Barre	0	------	0	0	1	0	0	0	0	0	5
Burlington	0	------	0	3	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	8
Massachusetts:											
Boston	0	------	0	376	7	70	0	14	3	45	199
Fall River	0	------	0	6	0	4	0	2	0	0	37
Springfield	0	------	0	39	0	20	0	1	0	13	37
Worcester	0	------	0	52	6	12	0	3	0	0	60
Rhode Island:											
Pawtucket	0	------	0	0	1	0	0	0	0	0	14
Providence	3	------	0	0	1	5	0	2	0	20	53
Connecticut:											
Bridgeport	0	------	0	7	1	3	0	1	0	3	36
Hartford	0	------	0	3	1	12	0	1	0	11	28
New Haven	0	------	0	1	2	22	0	1	0	1	35
New York:											
Buffalo	0	------	2	123	5	21	0	3	0	20	110
New York	11	12	1	4,600	74	258	0	73	4	88	1,387
Rochester	0	------	0	148	0	1	0	1	0	18	59
Syracuse	0	------	0	0	5	4	0	3	0	7	48
New Jersey:											
Camden	1	------	0	14	0	9	0	0	0	5	27
Newark	0	2	1	155	7	15	0	7	0	18	92
Trenton	0	------	0	54	2	30	0	3	0	2	37
Pennsylvania:											
Philadelphia	4	3	3	1,111	24	153	0	21	3	65	467
Pittsburgh	0	5	3	1,089	8	18	0	8	1	46	141
Reading	0	------	0	69	1	4	0	0	0	3	21
Scranton	0	------	0	41	0	0	0	0	0	2	-------
Ohio:											
Cincinnati	0	------	0	294	1	12	0	7	0	6	112
Cleveland	2	2	0	305	9	83	0	10	0	83	185
Columbus	0	1	1	183	2	19	0	4	0	4	79
Toledo	0	1	1	211	5	6	0	5	0	22	72
Indiana:											
Anderson	0	------	0	10	0	1	0	0	0	0	11
Fort Wayne	0	------	0	32	1	0	0	0	0	8	25
Indianapolis	5	------	0	314	9	17	0	4	0	15	89
Muncie	0	------	0	49	0	8	0	0	0	1	11
South Bend	0	------	0	40	0	1	0	0	0	1	16
Terre Haute	0	------	0	0	2	0	0	1	0	0	26
Illinois:											
Alton	0	------	0	4	2	1	0	0	0	0	14
Chicago	3	1	0	757	25	146	0	43	0	29	722
Elgin	1	------	0	83	0	0	0	0	0	0	4
Moline	0	------	0	36	0	0	0	0	0	2	13
Springfield	1	1	1	9	1	6	0	0	0	0	23
Michigan:											
Detroit	1	------	1	924	8	100	0	17	0	153	257
Flint	0	------	0	197	2	1	0	0	0	6	22
Grand Rapids	0	------	0	420	2	7	0	0	0	7	28
Wisconsin:											
Kenosha	0	------	0	181	0	0	0	0	0	0	11
Madison	0	------	0	8	0	4	0	0	0	2	10
Milwaukee	0	1	1	523	7	25	0	3	0	27	120
Racine	0	------	0	38	0	1	0	0	0	2	11
Superior	0	------	0	0	0	0	0	0	0	10	16

[1] Morbidity figures for Wheeling estimated; report not received.

City reports for week ended April 26, 1941—Continued

State and city	Diphtheria cases	Influenza: Cases	Influenza: Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0	------	0	0	2	0	0	0	0	26	19
Minneapolis	2	------	0	22	2	12	0	1	0	38	116
St. Paul	0	------	0	3	0	8	0	1	0	25	55
Iowa:											
Cedar Rapids	0	------	------	18	------	8	0	------	0	0	------
Davenport	0	------	------	4	------	1	0	------	0	1	------
Des Moines	0	------	------	11	------	3	0	------	0	6	33
Sioux City	0	------	------	9	------	0	0	------	0	5	------
Waterloo	0	------	------	29	------	1	0	------	0	2	------
Missouri:											
Kansas City	0	------	0	109	6	9	0	1	0	18	94
St. Joseph	0	------	1	18	4	2	0	0	0	2	25
St. Louis	0	3	0	322	9	82	0	3	0	37	284
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	12	11
Grand Forks	0	------	------	1	------	0	0	------	0	0	------
Minot	6	------	------	8	------	0	0	------	0	1	9
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	0	------
Sioux Falls	0	------	------	0	------	7	0	------	0	0	------
Nebraska:											
Lincoln	0	------	------	2	------	2	0	------	0	0	------
Omaha	1	------	0	7	0	1	0	0	0	1	55
Kansas:											
Lawrence	0	------	------	13	------	2	0	------	0	2	4
Topeka	0	------	0	183	2	4	0	1	0	6	20
Wichita	0	------	0	6	3	0	0	1	0	12	27
Delaware:											
Wilmington	0	------	0	43	2	11	0	1	0	1	33
Maryland:											
Baltimore	0	11	2	149	21	19	0	13	0	71	244
Cumberland	0	1	0	3	0	0	0	0	0	4	10
Frederick	0	------	0	0	0	1	0	0	0	0	4
Dist. of Col.:											
Washington	0	------	0	265	13	8	0	13	1	22	167
Virginia:											
Lynchburg	2	------	0	2	0	0	0	0	0	0	8
Norfolk	0	------	0	147	4	1	0	1	1	2	26
Richmond	0	------	1	84	4	0	0	1	0	0	44
Roanoke	0	------	0	27	3	0	0	0	0	0	19
West Virginia:											
Charleston	0	1	0	2	2	0	0	1	1	0	16
Huntington	0	------	------	161	------	0	0	------	0	5	------
Wheeling	------	------	0	------	1	------	------	0	------	------	19
North Carolina:											
Gastonia	0	------	------	27	------	0	0	------	0	1	------
Raleigh	0	------	0	65	3	0	0	3	0	19	21
Wilmington	0	------	0	12	2	0	0	0	0	8	8
Winston-Salem	0	1	0	23	0	1	0	1	0	23	16
South Carolina:											
Charleston	0	1	0	23	1	0	0	0	0	0	11
Florence	0	5	0	4	0	0	0	1	0	4	7
Greenville	0	------	0	13	2	0	0	0	0	8	10
Georgia:											
Atlanta	0	2	0	21	2	2	0	10	0	1	67
Brunswick	0	------	0	16	0	0	0	0	0	0	5
Savannah	0	272	0	29	3	0	0	2	0	3	40
Florida:											
Miami	0	3	1	17	0	2	0	1	0	5	47
St. Petersburg	1	------	0	87	1	1	0	0	0	0	22
Tampa	0	------	0	0	1	1	0	0	0	5	29
Kentucky:											
Ashland	1	------	0	7	0	0	0	1	0	2	7
Covington	0	------	0	10	0	6	0	1	0	0	14
Lexington	0	------	0	6	0	4	0	1	0	6	17
Louisville	0	------	0	930	8	43	0	2	0	11	79
Tennessee:											
Knoxville	0	------	0	71	2	7	0	2	0	1	22
Memphis	1	------	0	126	1	1	0	5	0	12	67
Nashville	0	------	1	77	6	3	0	0	0	0	43
Alabama:											
Birmingham	1	------	1	146	2	9	0	2	0	1	60
Mobile	0	2	1	2	1	0	0	0	0	0	17
Montgomery	0	------	------	23	------	1	0	------	0	2	------
Arkansas:											
Fort Smith	0	------	------	162	------	0	0	------	0	0	------
Little Rock	0	------	0	27	6	0	0	1	0	5	40

City reports for week ended April 26, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	2	0	0	0	0	0	0	3
New Orleans	5	2	1	18	4	8	1	10	0	6	132
Shreveport	0	------	0	2	2	0	0	1	0	0	27
Oklahoma:											
Oklahoma City	0	3	0	3	2	2	0	1	0	0	48
Tulsa	0	------	0	53	8	0	0	0	0	11	33
Texas:											
Dallas	2	------	0	34	1	6	0	2	0	7	60
Fort Worth	0	------	0	41	1	0	0	0	0	8	33
Galveston	0	------	0	7	1	0	0	0	0	0	14
Houston	4	----	1	1	1	1	0	6	1	0	74
San Antonio	0	2	2	8	8	1	0	9	0	1	64
Montana:											
Billings	0	------	0	0	0	1	0	0	0	0	9
Great Falls	0	------	0	2	1	1	0	0	0	0	10
Helena	0	------	0	2	0	0	0	0	0	0	1
Missoula	0	------	0	0	1	0	0	0	0	0	14
Idaho:											
Boise	0	------	0	11	0	0	0	0	0	0	4
Colorado:											
Colorado Springs	0	------	0	4	0	3	0	0	0	10	6
Denver	7	6	0	316	2	8	0	6	0	125	77
Pueblo	0	------	0	4	1	2	0	0	0	33	7
New Mexico:											
Albuquerque	0	------	0	59	2	0	0	0	0	0	11
Arizona:											
Phoenix	0	28	--------	8	------	1	0	------	0	3	--------
Utah:											
Salt Lake City	1	------	0	13	1	1	0	0	0	13	38
Washington:											
Seattle	2	------	0	3	2	2	0	5	0	21	103
Spokane	0	------	0	9	1	7	0	1	0	4	38
Tacoma	0	------	0	2	0	0	0	0	0	4	40
Oregon:											
Portland	1	------	0	12	1	5	0	1	0	0	56
Salem	0	------	--------	4	------	1	0	------	0	0	--------
California:											
Los Angeles	2	18	1	49	7	47	0	21	0	47	372
Sacramento	0	1	1	5	2	2	0	1	0	37	31
San Francisco	2	------	0	6	7	10	0	14	0	30	176

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Maryland:			
Boston	1	1	0	Baltimore	1	0	0
Springfield	1	0	0	South Carolina:			
Worcester	1	1	0	Charleston	1	0	0
New York:				Florida:			
New York	2	1	0	Miami	0	0	2
Pennsylvania:				Louisiana:			
Philadelphia	1	1	0	Shreveport	0	1	0
Pittsburgh	2	0	0	California:			
Ohio:				Los Angeles	1	0	0
Cleveland	1	0	1				
Illinois:							
Chicago	3	0	0				

Encephalitis, epidemic or lethargic.—Cases: Norfolk, 1. Deaths: Norfolk, 1.
Pellagra.—Cases: Baltimore, 1; Washington, 1; Savannah, 2; Montgomery, 1; New Orleans, 1.
Typhus fever.—Cases: New York, 1; New Orleans, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 5, 1941.—During the week ended April 5, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	13	3	2	12	2		3	4	40
Chickenpox		1	2	101	147	32	19	23	57	382
Diphtheria	2	16	2	21		1	2	1		45
Dysentery				1						1
Influenza	1	31			3	1			18	54
Measles		203	61	299	1,023	83	152	188	835	2,844
Mumps		10		214	289	56	33	9	43	654
Pneumonia		23			6	1	3		7	40
Poliomyelitis								1		1
Scarlet fever		27	9	93	193	10	5	9	18	364
Smallpox							6			6
Tuberculosis	4	4	5	84	38		19			154
Typhoid and paratyphoid fever			1	9	2					12
Whooping cough				102	136	1	2	10	21	272

FINLAND

Communicable diseases—4 weeks ended February 28, 1941.—During the 4 weeks ended February 28, 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	227	Poliomyelitis	5
Dysentery	1	Scarlet fever	466
Influenza	4,146	Typhoid fever	46
Paratyphoid fever	177		

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SCOTLAND

Vital statistics—Quarter ended December 31, 1940.—Following are provisional vital statistics for Scotland for the quarter ended December 31, 1940:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	12,999	10.3	Deaths from—Continued.		
Births	19,839	15.7	Heart disease	3,850	
Deaths	16,628	13.2	Influenza	81	0.06
Deaths under 1 year of age	1,509	[1] 76	Measles	65	.05
Deaths from:			Nephritis, acute and chronic	383	
Appendicitis	72		Pneumonia (all forms)	704	.56
Cancer	2,130	1.68	Puerperal sepsis	29	
Cerebral hemorrhage and apoplexy	1,089		Scarlet fever	7	.01
Cerebrospinal fever	79	.06	Senility	573	
Cirrhosis of the liver	43		Suicide	87	
Diabetes mellitus	222		Tuberculosis (all forms)	918	.73
Diarrhea and enteritis (under 2 years of age)	101		Typhoid and paratyphoid fever	5	
Diphtheria	233	.18	Whooping cough	77	.06

[1] Per 1,000 live births.

Vital statistics—Year 1940.—Following are provisional vital statistics for Scotland for the year 1940:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	53,509	10.6	Deaths from—Continued.		
Births	86,389	17.1	Heart disease	16,502	
Deaths	72,775	14.9	Influenza	1,801	
Deaths under 1 year of age	6,766	[1] 78.0	Measles	262	
Deaths from			Nephritis, acute and chronic	1,742	
Appendicitis	316		Pneumonia (all forms)	4,210	
Cancer	8,259		Puerperal sepsis	99	
Cerebral hemorrhage and apoplexy	7,160		Scarlet fever	35	
Cerebrospinal fever	482		Senility	2,534	
Cirrhosis of the liver	173		Suicide	400	
Diabetes mellitus	918		Tuberculosis (all forms)	4,003	0.82
Diarrhea and enteritis (all ages)	946		Typhoid and paratyphoid fever	27	
Diphtheria	676		Whooping cough	197	

[1] Per 1,000 live births.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

Note.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the Public Health Reports of April 25, 1941, pages 924–928. A similar table will appear in future issues of the Public Health Reports for the last Friday of each month.

Yellow Fever

Colombia.—Yellow fever has been reported in Colombia as follows: Antioquia Department, January 12, 1941, 1 death; Boyaca Department, April 11, 1941, 1 death.

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Public Health Reports

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IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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AN OUTBREAK OF PSITTACOSIS AT THE NATIONAL ZOOLOGICAL PARK, WASHINGTON, D. C.[1]

By T. H. TOMLINSON, JR., *Passed Assistant Surgeon, United States Public Health Service*

Last winter there occurred at the National Zoological Park, Washington, D. C., an outbreak of psittacosis. Because of the economic damage to the bird collection, the public health hazard, and the problem of adequate quarantine of imported birds, it is felt that a report of this outbreak would be of some interest and value.

In an effort to prevent the introduction of psittacosis into the bird house, certain quarantine procedures have been routinely practiced for a number of years. These preventive measures consisted of the isolation of all newly imported psittacine birds for a minimum of 3 weeks after arrival. Since 1937 all birds dying during this quarantine period have been submitted to the Division of Pathology, National Institute of Health, for examination for psittacosis. Up to the present time this procedure has not revealed any infected birds among the new acquisitions.

On January 21, 1941, two dead parrots were received from the principal keeper in charge of the bird house. These were not from the lot then in quarantine but were from the collection on exhibit in the parrot room. Two days later, before the diagnosis on these first two was conclusive, a third parrot was received. Simultaneously, the director of the park reported that one of the bird house employees was ill. On January 24, the findings in the first two parrots were so suggestive of psittacosis that the director closed the parrot room of the bird house. On the morning of January 25, a definite diagnosis of psittacosis was made on the first two birds and the entire bird house was closed to the public. On this same day a diagnosis of psittacosis was made on the sick attendant.

Faced with the definite appearance of this serious and contagious disease, the authorities of the park began to submit for examination to the National Institute of Health all birds found dead and also all those destroyed because of apparent illness. The following report is based upon the data obtained from the examination of the first 60

[1] From the Division of Pathology, National Institute of Health.

birds received, of which 51 died and 9 were killed. All birds dying in the enclosed bird house were submitted. In addition, for the first 2 weeks all dead birds from outdoor cages were examined.

Examination was carried out from a few hours to 2 days after death; in the latter case the bird was preserved for most of this time at 0° C. In most cases tissue emulsions were injected into mice at the time of autopsy, but occasionally the tissue was preserved in 50 percent neutral buffered glycerine for from 1 to 10 days before inoculation. In spite of the interval between death and fixation, the solid organs of most birds were well enough preserved to permit histopathological diagnosis, attention being mainly centered on the liver and kidney. Because of autolysis, the gastro-intestinal tract was rarely examined.

For mouse inoculation, the spleen or part of the liver, sometimes both, were emulsified in 3 to 6 cc. of sterile distilled water and 0.5 cc. of the emulsion was injected intraperitoneally into white mice. Since it is often impossible to make a positive morphological diagnosis from the originally inoculated mice, subsequent mouse to mouse transfers were made at 4- to 12-day intervals, using the emulsified mouse spleen as the inoculum. Generally by the third transfer definite evidence of the presence of the virus appears if the tissue was infected.

A portion of each tissue emulsion was inoculated on a plain agar slant and incubated at 37° C. for a minimum of 6 days. When massive bacterial contamination appeared or when an organism of especially high virulence for mice was present, additional material was passed through either a Berkfeld N or a Seitz pad and mouse inoculation was begun anew. Material from 5 of the positive birds was successfully filtered although there was apparently a moderate loss of virus in the process.

For a mouse to be considered positive after inoculation with suspected material, two morphologic criteria must be demonstrable. The first of these is the presence in mononuclear cells of the psittacosis bodies or Levinthal-Coles-Lillie (L. C. L.) bodies. Cells bearing these structures are most readily found in peritoneal impression smears. Less constantly in sections, the bodies may be seen in the inflammatory exudate covering the liver or spleen capsule and sometimes also in Kupffer cells, reticulum cells of the spleen, and in inflammatory cells in liver lesions. The second evidence, somewhat irregular in its time of appearance, consists of multiple foci of liver cell necrosis free of bacteria. In addition to these two diagnostic morphologic features, after repeated mouse transfers the virus must be capable of killing white mice in 2 to 8 days, using 0.5 cc. of a 1 to 20 mouse spleen emulsion.

Some birds, notably parrakeets, from which virus can later be recovered will show pathological changes insufficient to warrant a definite diagnosis of psittacosis. For this reason the mouse inoculation procedure is by far the most reliable and important method of diagnosis.

A direct morphologic diagnosis upon bird tissues as received is somewhat more uncertain and difficult because of the unknown duration of the disease process and other variables such as species differences, complicating disease processes, and poor tissue preservation. In a number of the birds examined from this outbreak, a positive histologic diagnosis based on the demonstration of L. C. L. bodies and focal necrosis or cellular nodules in the viscera was possible. However, virus was recovered from some birds which failed to present lesions sufficiently characteristic for diagnosis.

In table 1 are presented the data on the 15 birds found positive on examination. In 11, a definite direct histological diagnosis of psittacosis was made. Owing to autolysis, no tissue was examined from one (No. 54). One (No. 13) showed a marked subacute nephritis, but no L. C. L. bodies could be identified with certainty. In 2 (Nos. 12 and 45), there was focal liver necrosis without definite L. C. L. bodies, but suggestive structures were seen in the capsular exudate in the first and in renal tubules in the second.

The size of the spleens varied greatly, some being 2.5 cm. in diameter while others were considered as of normal dimensions. In no case did the lungs show any significant lesions. All of the 14 positive birds from which tissue was examined presented visible damage either in the liver or kidney, while L. C. L. bodies were identified in 11. All 14 livers showed focal infiltration, 12 showed necrosis, and L. C. L. bodies were present in 7. Each of the 13 kidneys examined showed interstitial infiltration and tubular necrosis. Typical psittacosis bodies were seen in 11 and intracellular granules of suspicious but not typical appearance were seen in the other 2 kidneys. In 4 birds L. C. L. bodies were found in the kidney when prolonged search failed to reveal them in the liver, but in no case was the converse true. Since psittacosis bodies appeared in 84.6 percent of the kidneys and in only 50 percent of the livers, it would seem advisable always to include sections of kidney tissue in the histological examination of suspected birds.

Material from 14 of the positive birds was inoculated intraperitoneally into white mice. Seven of these gave positive results on the initial transfer, 5 on the second, and 2 on the third passage. Virus from 1 bird was carried through five serial passages and from another it was propagated through two separate series of 4 transfers each. In the remaining cases, the number of mouse passages varied from 1 to 4.

TABLE 1

Date received	Bird No.	Pathology No.	Name of bird	Liver			Kidney			Mouse inoculation
				Necrosis	Infiltration	L. C. L. bodies	Necrosis	Infiltration	L. C. L. bodies	
Jan. 21, 1941	1	19456	Yellow-headed parrot (*Amazona ochrocephala*)	+	++	++	±	+++	+	Positive on first transfer.
Do.	2	19457	Festive parrot (*Amazona festiva*)	+	++	++	+	+	+	Do.
Jan. 23, 1941	3	19466	Double yellow-headed parrot (*Amazona ochrocephala*)	+++	++	+++	+	++	+	Not done.
Jan. 30, 1941	12	19542	Orange-winged parrot (*Amazona amazonica*)	+	+	−	(1)	(1)	(1)	Positive on first transfer.
Do.	13	19543	Java sparrow (*Munia oryzivora*)	±	+	−	+	+	(?)	Positive on second transfer.
Feb. 27, 1941	41	19707	Double yellow-headed parrot (*Amazona ochrocephala*)	−	++	−	++	++	++	Positive on third transfer.
Mar. 6, 1941	45	19809	Boquet's parrot (*Amazona arausiaca*)	+	+	−	+	±	(?)	Positive on first transfer.
Do.	46	19810	African red-eyed dove (*Streptopelia semitorquata*)	+	++++	++++	+	+	+	Do.
Mar. 8, 1941	47	19823	Double yellow-headed parrot (*Amazona ochrocephala*)	−	+++	−	++	+++	+++	Do.
Mar. 12, 1941	50	19826	do.	+	++	−	±	±	±	Positive on second transfer.
Mar. 17, 1941	53	19829	African gray parrot (*Psittacus erithacus*)	+	+++	+	+	++	+	Do.
Do.	54	19830	Double yellow-headed parrot (*Amazona ochrocephala*)	(2)	(2)	(2)	(2)	(2)	(2)	Do.
Do.	55	19831	African red-eyed dove (*Streptopelia semitorquata*)	+	+	+++	+	+	±	Do.
Mar. 29, 1941	60	19932	Double yellow-headed parrot (*Amazona ochrocephala*)	±	+	−	+	+	+	Positive on third transfer.
April 7, 1941	63	19997	do.	++	++	+++	+	+	+	Positive on first transfer.

[1] No tissue.

[2] Autolyzed.

Of the 15 infected birds, 11 were South American parrots (*Amazona*), 1 was an African gray parrot (*Psittacus*), 1 a Java finch (*Munia*), and 2 were African doves (*Streptopelia*). All of these birds came from the bird house, the Amazons and the African gray from the parrot room which is located at one end of the building and opens into the large entrance hall by means of a double door. At the opposite end of this hall is a similar room where the finch was caged. The African doves occupied a more central position in the house, the cages having their backs placed against the solid partition forming one wall of the parrot room.

In table 2 are listed the 43 birds in which no evidence of psittacosis could be demonstrated. Included here are the 6 dying outside the bird house proper and 4 of the Amazons which were killed because of suspicious symptoms. It is quite possible that many of the finches dying during the first few days of February were victims of the vapor from the solution of formalin used for disinfection of the premises.

TABLE 2

Date received	Bird No.	Pathology No.	Name of bird	Tissue examination	Mouse inoculation
Jan. 28, 1941	4	19530	Yellow-headed parrot (*Amazona ochrocephala*)	Bacteremia, type undetermined.	Bacteremia.
Do	5	19529	Finch (*Munia* ?)	Negative	Negative.
Jan. 30, 1941	7	19537	Double yellow-headed parrot (*Amazona ochrocephala*).	do	Do.
Do	8	19538	Orange-winged parrot (*Amazona amazonica*)	Granulomata in liver (undetermined etiology).	Do.
Do	10	19540	Yellow-headed parrot (*Amazona ochrocephala*).	Negative	Do.
Do	11	19541	Yellow-naped parrot (*Amazona auropalliata*).	do	Do.
Do	14	19544	Java sparrow (*Munia oryzivora*)	do	Do.
Do	15	19552	Liberian crested eagle (*Stephanoaetus coronatus*).	Focal necrosis in liver (undetermined etiology).	Do.
Do	16	19551	Silver gull (*Larus novaehollandiae*)	Negative	Do.
Feb. 3, 1941	17a	19572	Long-tailed finch (*Poephila acuticauda*).	do	Do.
Do	17b	19573	do	do	Do.
Do	17c	19574	do	do	Do.
Do	17d	19575	do	do	Do.
Do	18a	19576	Gouldian finch (*Poephila gouldiae*)	do	Do.
Do	18b	19577	do	do	Do.
Do	19	19578	Banded finch (*Steganopleura bichenovii*).	do	Do.
Do	21	19581	do	do	Do.
Feb. 5, 1941	22	19584	Mallard duck (*Anas platyrhynchos*)	Focal necrosis in liver (undetermined etiology).	Do.
Feb. 7, 1941	24	19592	Fischer's lovebird (*Agapornis fischeri*).	Negative	Do.
Feb. 8, 1941	26	19594	Palawan peacock pheasant (*Polyplectron napoleonis*).	Pneumonia with abscesses.	Do.
Do	27	19595	Black crested finch (*Lophosphingus pusillus*).	Negative	Do.
Do	29	19597	Orange-chinned parrot (*Brotogeris jugularis*).	Perirenal abscess	Do.
Feb. 10, 1941	30	19598	Bald eagle (*Haliaeetus leucocephalus*).	Trematode in bile duct	Do.
Do	31	19599	Mallard duck (*Anas platyrhynchos*)	Negative	Do.
Do	32	19600	Pintail (*Dafila acuta*)	do	Do.
Feb. 11, 1941	33	19618	Indian black-necked stork (*Xenorhynchus asiaticus*).	Old generalized parasitic infestation.	Do.

TABLE 2.—Continued

Date received	Bird No.	Pathology No.	Name of bird	Tissue examination	Mouse inoculation
Feb. 20, 1941	35	....	Diuca finch (*Diuca diuca*)..........	No tissue...............	Negative.
Do.......	36	19679	Leadbeater's cockatoo (*Kakatoe leadbeateri*).	Negative...............	Do.
Feb. 25, 1941	37	19690	Diuca finch (*Diuca diuca*)..........	.....do...............	Do.
Do.......	38	19691	Gouldian finch (*Poephila gouldiae*).	.....do...............	Do.
Feb. 27, 1941	39	....	Shiny cowbird (*Molothrus bonariensis*).	No tissue...............	Do.
Do.......	40	19708	Kiskadee flycatcher (*Pitangus sulphuratus*).	Negative...............	Do.
Mar. 3, 1941	42	19735	Crested fire-back pheasant (*Diardigallus diardi*).	Trematode worm in kidney pelvis.	Do.
Do.......	43	19736	Migratory quail (*Coturnix coturnix*).	Tuberculosis; retained egg.	Tuberculosis.
Do.......	44	19737	Saffron finch (*Sicalis flaveola*)......	Negative...............	Negative.
Mar. 8, 1941	49	19825	Migratory quail (*Coturnix coturnix*).	Tuberculosis............	Tuberculosis.
Mar. 12, 1941	51	19827	Ground pigeon (*Geopelia striata*) ..	Negative...............	Negative.
Mar. 17, 1941	56	19832	Tambourine dove (*Tympanistria tympanistria*).	Marked autolysis........	Do.
Mar. 22, 1941	57	19874	Screech owl (*Otus asio*)............	Negative...............	Do.
Do.......	58	19875	Diuca finch (*Diuca diuca*)..........	.....do...............	Do.
Mar. 25, 1941	59	19893	Ring dove (*Turtur risorius*)........	... do	Do.
Apr. 2, 1941	61	19978	Screech owl (*Otus asio*)............	Marked fatty degeneration of liver.	Do.
Do.......	62	19979	Diuca finch (*Diuca diuca*)..........	Fatty degeneration of liver.	Do.

In this group there were several incidental findings of some interest. From parrot No. 4 a small, gram-negative coccobacillus was isolated which proved highly virulent for mice, causing death within 20 hours. Marked confluent lobular pneumonia with abscesses was present in pheasant No. 26. Parrot No. 29 showed an abscess in the region of the left kidney and sex organs. In bald eagle No. 30 a trematode parasite completely filled a large bile duct. An Indian stork (No. 33) showed marked serosal and visceral dissemination of small, focally calcified, parasitic cysts of an undetermined nature. In a second pheasant (No. 42) one kidney pelvis contained a portion of a trematode worm. Two migratory quails (Nos. 43 and 49) showed extensive avian tuberculosis, while the former in addition had a 5 by 3 cm. retained egg, partially encapsulated and decomposed. A screech owl (No. 61) presented marked diffuse fatty degeneration of the liver,. while a finch (No. 62) showed a similar moderate and focal process.

Two birds not included in either table 1 or table 2 were considered doubtful. A double yellow-headed parrot (*Amazona ochrocephala*) (No. 9) gave negative results on mouse inoculation in spite of the presence of a very large spleen and many foci of degenerating parenchymal cells and infiltrating leucocytes in the liver. Serial passage of this material through 4 groups of mice resulted in only 1 death on the eleventh day in the initial transfer. Examination of the second bird, a ground pigeon (*Geopelia striata*) (No. 52), gave such inconsistent results that one must feel reluctant to classify it as psittacotic.

The bird's tissues presented no characteristic lesions, and no typical L. C. L. bodies were found in the liver or kidney. Inoculation of tissue emulsion into mice produced granulomatous lesions in some animals after 5 to 8 days but no typical L. C. L. bodies could be demonstrated in the spleens or livers of such animals. However, in a few mice larger intracellular bodies of uncertain nature were seen in peritoneal impression smears and in capsular exudate on the surface of the liver in sections. Consistent and characteristic results could not be obtained even after passing the material through two separate series of 4 mouse passages each

It is highly probable that the original source of the infection causing the outbreaks just described will never be discovered. Epidemiological investigation is hopelessly complicated by the custom long practiced of receiving as gifts or loans occasional birds from outside donors. Birds so acquired were housed indiscriminately with those of the general collection. Since September 1938, 12 grass parrakeets (*Melopsittacus undulatus*) were thus received, the last 4 being taken June 19, 1940. During the past year several canaries and 2 toucans, but apparently no parrots, were obtained in this manner. During the fall of 1940, however, a single parrot belonging to the collection was loaned out for a brief time in Arlington County, Va., and was returned to the park after a few days. A large group of nonpsittacine birds consisting mainly of finches was imported from South America in April 1940, and 5 African doves were brought from Liberia the following month. The last large importation of psittacine birds into the bird house came from Sumatra in the fall of 1937. At that time the 39 birds dying during the quarantine period were examined here with negative results.

The preceding catalogue of importations unfortunately does not furnish any clear information on the possible source of the infection. Of the birds dead of psittacosis, the last date of contact with natural environment can be determined only in the case of the 2 doves. As noted above, these arrived from Liberia May 17, 1940. The finch was obtained from Sumatra in 1937. The African gray parrot had been in private possession for a number of years before being donated to the park in 1930. By far the largest group of infected birds consisted of the Amazons and unfortunately these had been acquired from diverse sources over a long period of time and their individual identity was lost when they were incorporated into the general collection. They, therefore, can contribute no information on the possible source of infection.

Since even the most recently acquired birds had been under observation in captivity for a considerable period, the possibility that the infection had been introduced by an apparently healthy carrier may be considered. Such a carrier may have become an active shedder of

virus due to some break-down in general health. Some support is furnished this theory by the fact that a temporary break-down of the heating system of the bird house had occurred about a week before the first appearance of psittacosis among the birds. It is well known that these tropical and subtropical birds are very sensitive to changes in temperature and that even a brief exposure to cold greatly lowers their resistance. It is likewise recognized that chilling, unsanitary environment, and improper feeding will often turn an apparently previously healthy bird, that is, one with subclinical psittacosis, into an active shedder of the virus.

The first human contact case was that of an assistant keeper whose only previous association with birds had been in his own home. He entered upon duty in the bird house on December 9, 1940, and became ill 33 days later. The remaining 7 employees have been regularly employed there for periods ranging from 3 to 20 years. These may have escaped infection because of some degree of natural immunity developed through prolonged intermittent contact with birds; however, it seems more probable that the sick attendant acquired his infection through concentrated exposure to virus-bearing birds. Although all the men worked in the parrot room at various times, the new employee spent the entire morning, 6 days a week, in cleaning and feeding in that room. After he became ill, his work was taken over almost entirely by the principal keeper, who in turn fell sick on April 9, 1941. Since neither patient was able during his illness to raise a satisfactory specimen of sputum, no material was available from which to attempt isolation of the virus. The diagnosis of psittacosis was made by the attending physicians on history of exposure, clinical findings, and serial X-ray examination of the lungs. Both patients have since recovered from the illness.

Fortunately there have been no reported cases of psittacosis among the residents of or visitors to the city of Washington, D. C. At the National Zoological Park it has been the routine custom to clean all cages thoroughly early each morning, to isolate promptly all sick birds, and to keep the public at a distance from the birds by means of either glass fronts or guard rails placed 3 feet in front of all open cages. The observance of these sanitary precautions, followed by the prompt closing of the bird house as soon as the infection was recognized, has probably prevented the spread of psittacosis to visitors to the park. Their exposure to the virus, even during the last few days the house remained open, must have been very slight.

Following the closure of the bird house on January 25, the District of Columbia Health Department and the National Zoological Park personnel instituted certain measures aiming at control of the epizootic. These included the wearing of masks by the attendants, the

prompt isolation of all sick birds, the daily spraying of all cages with a weak solution of formalin and the removal of all excreta and refuse in a wet state. After the appearance of the second human case, the 16 remaining Amazons in the house, though apparently healthy, were killed. No histologic evidence of psittacosis was found in these birds and since mouse inoculation could not be done at that time, these parrots are not included in the preceding discussion.

On May 6, 1941, after consultation with the District of Columbia Health Department, the director of the park opened to the public a small portion of the bird house from which no virus-bearing birds had been obtained. The reopened section consists of a large hall placed at the extreme back of the house, having a separate rear entrance and containing all glass-enclosed cages. It is now completely closed off from the rest of the building containing the three rooms from which the positive birds were obtained.

This partial reopening was authorized by the responsible officials because all the Amazons had been disposed of, the last virus-bearing parrot had died 1 month before, and the last nonpsittacine bird known to have been infected had died 7 weeks previously. Consequently it was felt that visitors were no longer exposed to any appreciable risk of infection, and that such part of the bird collection as was housed in the supposedly uncontaminated section of the building could once more safely be opened to public inspection.

SUMMARY

An outbreak of psittacosis among birds in the National Zoological Park in Washington, D. C., is reported. Fifteen birds positive for psittacosis were discovered among 60 dying or killed during the epizootic. These consisted of 12 parrots, both South American and African, 1 finch, and 2 African doves. The technique of laboratory diagnosis of infected birds is briefly discussed. Two of the 8 bird house employees developed clinical psittacosis but have since recovered. No cases of the disease have been reported among the general population. Control measures taken by the local authorities to eradicate the disease in the bird collection and prevent its spread to the general population have been described.

ACKNOWLEDGMENTS

The author gratefully acknowledges his indebtedness to Dr. William M. Mann, Director, and Mr. Malcolm Davis, Principal Keeper, at the National Zoological Park for furnishing the material for this study and to Dr. Herbert Friedmann, Curator of Birds, National Museum, for identifying the birds examined.

QUANTITATIVE STUDIES OF THE TUBERCULIN REACTION

I. Titration of Tuberculin Sensitivity and its Relation to Tuberculous Infection [1]

By MICHAEL L. FURCOLOW, *Assistant Surgeon, United States Public Health Service*, BARBARA HEWELL, *Pediatrician, Anti-Tuberculosis League*, WALDO E. NELSON, *Professor of Pediatrics, Temple University*, and CARROLL E. PALMER, *Passed Assistant Surgeon, United States Public Health Service*

It is common practice to consider that the tuberculin test, within the limits of dosage ordinarily employed, will detect all persons who are capable of reacting to tuberculin. There does not seem to be conclusive evidence, however, that the usual second strength dose of tuberculin is the limit of dosage which will detect all reactors (*1–3*, *8*). It is well known that a definite percentage of persons who are negative to the first test dose will react to the second test dose. Will an increasing proportion of persons react as the quantity of tuberculin is increased? If this is true, will the maximum number of reactors who can be detected by even the largest doses of tuberculin be the correct index of those infected with the tubercle bacillus? Or, will reactors to the larger doses be related in a different manner to tuberculous infection than reactors to the smaller doses?

The present study was undertaken in an attempt to answer some of the questions presented above. It was decided to use a more accurately quantitative method of tuberculin testing than the ordinary two-dose method. This method consisted in the use of a number of doses of tuberculin of different concentrations so that there could be determined the lowest dose (in milligrams) of tuberculin to which each individual would react. The application of the same method to various population groups allows comparisons to be made among the groups not only as to tuberculin sensitivity but as to contact with the tubercle bacillus, age, and other factors.

MATERIAL AND METHODS

Plan of study.—The general plan of the study was to test the members of several different population groups, employing a graduated series of increasing concentrations of tuberculin. Thus, all of the persons in a particular group were tested initially with an exceedingly dilute concentration of tuberculin. Those who did not show a reaction to this test were retested 4 days later with a more concentrated solution. Those who still failed to have a reaction were tested again with a higher concentration. This procedure was continued step by step, eliminating the reactors, and retesting the nonreactors with a more concentrated solution until either all those tested reacted, or the largest dose in the graduated series was given.

[1] From the Division of Public Health Methods, National Institute of Health, and the Children's Hospital Research Foundation, Department of Pediatrics, University of Cincinnati.

The tuberculin.—Dilutions from a single lot of tuberculin PPD were used for all of the tests. Two grams of PPD, lot number 98970, were obtained through the courtesy of Dr. Florence Seibert of the Henry Phipps Institute. This product was standardized by Doctor Seibert at the beginning and at the completion of the study. She reported that this lot of PPD was "about one-half as potent" as her standard, but that it was essentially equal in strength to commercial PPD, and that there appeared to be no loss of potency during the period of study.

The entire 2-gram sample of PPD was preserved as a 2-percent solution in physiologic saline with 0.5 percent phenol. Repeated cultures failed to reveal any evidence of bacterial contamination. Chemical glassware and pipettes were employed for the dilutions which were made by one person within 24 hours of use. Glassware, pipettes, and syringes were cleansed by boiling for 10 minutes in strong soap solution and then were immersed for at least 24 hours in strong sulfuric acid-dichromate cleaning solution. This was done before and after use to destroy any adherent tuberculin (*4*).

Schedule of dosage.—Twelve doses of tuberculin were employed, ranging from 1/100 billionth of a milligram in 0.1 cc. to 1.0 mg. in 0.1 cc. of physiologic saline solution. The concentration of tuberculin increased ten times with each succeeding test. The schedule of dosage is shown in table 1.

TABLE 1.—*Schedule of the dose of tuberculin used in the various tests*

Test No.	Dose of PPD in mg. in 0.1 cc.	Test No.	Dose of PPD in mg. in 0.1 cc.
1	0.00000000001 (1/100 billionth).	7	0.00001 (1/100 thousandth).
2	0.0000000001 (1/10 billionth).	8	0.0001 (1/10 thousandth).
3	0.000000001 (1/1 billionth).	9	0.001 (1/1 thousandth).
4	0.00000001 (1/100 millionth).	10	0.01 (1/100th).
5	0.0000001 (1/10 millionth).	11	0.1 (1/10th).
6	0.000001 (1/1 millionth).	12	1.0 (1 mg.).

The complete schedule of 12 tests was not followed for the testing of all the population groups. While the tests omitted varied with the different groups, all groups received each of the last 6 tests (tests 7 to 12, inclusive).

Testing procedure.—The tests were performed by the intracutaneous method, new syringes and needles being employed; 0.1 cc. of the required dilution of tuberculin was injected into the flexor surface of the forearm. A different site was employed for each injection, progressing from above distally to avoid accentuation of the reaction by drainage of tuberculin through the lymphatics. The reactions were read at 24, 48, and 72 hours, and measurements were recorded in millimeters for the two greatest diameters of both edema (induration) and erythema. In the analysis of the data, the size of the area

of either edema or erythema was considered to be the average of the measurements of their respective diameters. In this study the term "positive reaction" refers to a reaction with an area of edema (induration) whose average diameter measured 5 mm. or more at the time of the 48-hour reading. A reaction consisting of erythema only was considered negative, irrespective of size.

The procedures for testing each group were essentially identical. An initial test employing one of the dilute solutions of tests 1 to 7 (table 1) was administered to each person. Increasingly larger doses of tuberculin were injected in those who had no reaction or a reaction consisting of an area of induration of less than 10 mm. It is to be noted that the criterion for elimination from further testing (10 mm. or more of edema at 48 hours) was different from that employed for the determination of positive reactions (5 mm. or more of edema at 48 hours). This was done to make certain that the smaller reactions were actually positive ones and not artifacts.

Definition of terms.—The testing of a person by the procedure outlined above determines the smallest dose of tuberculin PPD to which he will react. This dose may be defined as the "sensitivity level" of that individual. The application of this testing procedure to any population group determines the "sensitivity levels" of all of its members. For example, a certain number of the population will fall into the most sensitive class (those reacting to the smallest dose), others will react to the next larger dose, and so on until the largest dose is reached. The remainder will consist of those who do not react even to the largest dose. In order to determine the total number of persons who would react to any given dose if the entire population were tested with that dose alone, it is necessary to add the number of reactors to that dose and to all the smaller doses, since it may be assumed that those who react to any of the smaller doses would also react to a larger dose. For example, if test number 5 alone were applied to the entire population the number of reactors to that dose would be the number reacting to tests 1, 2, 3, 4, and 5. Therefore, in order to obtain the number of reactors to each of the doses if used alone the number reacting to the various test doses was accumulated as above and called the "accumulated number of positive reactors" to each test dose. When expressed as a percentage of the entire population tested, this accumulated number becomes the "accumulated percentage of positive reactors" to the various test doses of tuberculin. The plotting of the accumulated percentage of positive reactors against dosage results in a curve which may be defined as the "sensitivity curve" for the population under discussion. Thus, a population composed of a high percentage of persons hypersensitive to tuberculin would have a curve rising sharply for the smaller doses whereas a relatively insensitive population would

not present this sharp rise for the smaller doses. Precise comparison of the "sensitivity curves" for the various population groups is possible since the same technique and the same tuberculin solution were employed throughout.

Population groups tested.—Since the quantitative determination of sensitivity to tuberculin requires repeated tests, it appeared more practical to study institutional groups. There was also a greater likelihood that all of the group, including the staff, could be examined clinically and roentgenographically. It is recognized that institutional groups may not represent adequately the general population, but the difficulties involved in repeated testing of any general population group are obvious.

Nontuberculous groups.—Children: The original group tested consisted of 553 white children residing in an orphanage in Ohio. These children ranged in age from 6 to 19 years, 83 percent of them being 12 years of age or older. Of the total group, 56 percent were boys and 44 percent were girls. A roentgenogram of the chest was made of each of the children and of each of the 200 adults in the institution. When there was evidence indicating the possibility of a tuberculous lesion, the person was carefully studied by other clinical methods. No proved active tuberculosis was found among either the adults or the children in the orphanage.

Infants and young children: In this group there were 116 infants and young children ranging in age from birth to 6 years who were residents of two foundling homes. No roentgenographic evidence of pulmonary tuberculosis was found in the children of either institution. Roentgenographic studies were not made of the adults in these institutions.

Tuberculous and contact groups.—Children: Three different groups were tested: (1) 60 children who were patients in a hospital for active tuberculosis; (2) 46 children in a preventorium for inactive cases of tuberculosis and for children who had had intimate contact with tuberculosis; and (3) 101 children in an antituberculosis camp, about 60 percent of whom had a history of probable contact with active tuberculosis. These children ranged in age from a few days to 14 years. Clinical and roentgenographic studies, as well as family investigations, were made on all of the children in each of these groups.

Adults: The first group under this heading consisted of the entire adult population of a hospital for the treatment of active tuberculosis. There were 468 white and colored patients ranging in age from 15 to 70 years, whose clinical diagnoses varied from minimal to far advanced tuberculosis. Less than 10 percent of this group were reported to have had a tuberculin test previously. Clinical and roentgenographic data in relation to tuberculous disease were available for these patients.

The second group consisted of 499 adults ranging in age from 15 to 60 years who were inmates of an institution for the insane. Since more than 10 percent of this group were found to have active tuberculosis, the remaining patients were considered as tuberculous contacts. Roentgenograms of the chests were made of all of the inmates, and those who were suspected of having tuberculosis were subjected to further clinical study.

RESULTS

Nontuberculous groups.—Children 6 to 19 years of age: The results of the quantitative testing of the 553 children in the orphanage are presented in table 2 and figure 1. In table 2 are shown the number of positive reactors as well as the accumulated number and accumulated percentage of positive reactors to the various test doses of tuberculin PPD. Figure 1 illustrates the accumulated percentage of positive reactors, or the "sensitivity curve" for this group. The vertical lines, marked I and II, on this and on all succeeding figures represent, respectively, the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

TABLE 2.—*Number and percentage of children positive*[1] *to various test doses of tuberculin PPD among 553 white boys and girls aged 6–19 years in an orphanage*

Test No.	Tuberculin PPD, test dose in mg.	Number positive[1] reactors	Accumulated number[2] positive	Accumulated percentage[3] positive
1	0.00000000001 (1/100 billionth)			
2	0.0000000001 (1/10 billionth)			
3	0.000000001 (1/1 billionth)			
4	0.00000001 (1/100 millionth)	1	1	0.2
5	0.0000001 (1/10 millionth)			
6	0.000001 (1/1 millionth)			
7	0.00001 (1/100 thousandth)	94	95	17.2
8	0.0001 (1/10 thousandth)	16	111	20.1
9	0.001 (1/1 thousandth)	84	195	35.3
10	0.01 (1/100th)	131	326	59.0
11	0.1 (1/10th)	159	485	87.7
12	1.0 (1 mg.)	46	[4] 531	96.0

[1] Positive=edematous reaction measuring 5 mm or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there were 22 cases which were negative to all tests.

It will be noted in figure 1 that there is a steady increase in the accumulated percentage of positive reactors with increase in the dosage of tuberculin. Approximately 20 percent of the children had positive reactions at the level of the usual first testing dose of PPD, 50 percent at the level of the second testing dose, and 96 percent at the largest dose, 1.0 mg. of tuberculin. It is seen that in this group of children the percentage of reactors to tuberculin is directly related to dosage, since with proper selection of dosage any desired percentage from 0.2 percent to 96 percent would be obtained.

In view of the absence of cases of significant active tuberculosis among either the children or the adults in the institution, data were obtained concerning the history of contact of the children with tuberculosis prior to admission to the institution. Family histories taken by social workers were available on 309 of the children. Of these, 61 had a history of contact with tuberculosis before admission to the orphanage but 248 had no obtainable history of contact. Approximately 20 percent of this group, therefore, had a positive history of contact.

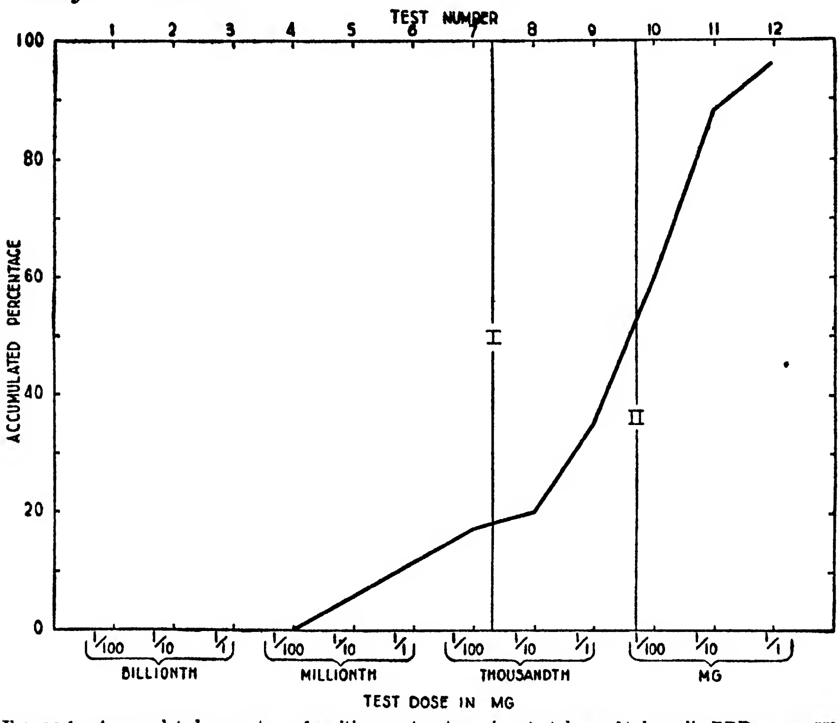

FIGURE 1.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 553 white boys and girls aged 6–19 years in an orphanage. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

The response to tuberculin of the children with a history of contact with tuberculosis and of those with no history of contact is shown in table 3 and figure 2. It is evident that the children with a history of contact were much more sensitive to tuberculin than were the children of the entire orphanage group. Conversely, the children who had no history of contact with tuberculosis were less sensitive. The increased sensitivity of those with a positive history of contact may be illustrated by the response to test number 7, which is slightly less concentrated than the usual first testing dose of PPD. At this level only 6.5 percent of the children without a history of contact

had positive reactions in contrast to 77 percent of the children with a history of contact with tuberculosis.

TABLE 3.—*Number and percentage of children positive*[1] *to various test doses of tuberculin PPD among 309 white boys and girls aged 6–19 years in an orphanage, arranged according to their contact with tuberculosis*

Test No.	Tuberculin PPD, test dose in mg.	61 children with a positive history of contact with tuberculosis			248 children with no history of contact with tuberculosis		
		Number positive[1] reactors	Accumulated number[2] positive	Accumulated percentage[3] positive	Number positive[1] reactors	Accumulated number[2] positive	Accumulated percentage[3] positive
1	0.00000000001 (1/100 billionth)	----------	----------	----------	----------	----------	----------
2	0.0000000001 (1/10 billionth)	----------	----------	----------	----------	----------	----------
3	0.000000001 (1/1 billionth)	----------	----------	----------	----------	----------	----------
4	0.00000001 (1/100 millionth)	1	1	1.6	0	0	0
5	0.0000001 (1/10 millionth)	----------	----------	----------	----------	----------	----------
6	0.000001 (1/1 millionth)	----------	----------	----------	----------	----------	----------
7	0.00001 (1/100 thousandth)	46	47	77.0	16	16	6.5
8	0.0001 (1/10 thousandth)	1	48	78.7	5	21	8.5
9	0.001 (1/1 thousandth)	2	50	82.0	45	66	26.6
10	0.01 (1/100th)	4	54	88.5	67	133	53.6
11	0.1 (1/10th)	7	61	100.0	77	210	84.7
12	1.0 (1 mg.)	0	----------	----------	22	[4] 232	93.5

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there were 16 cases which were negative to all tests.

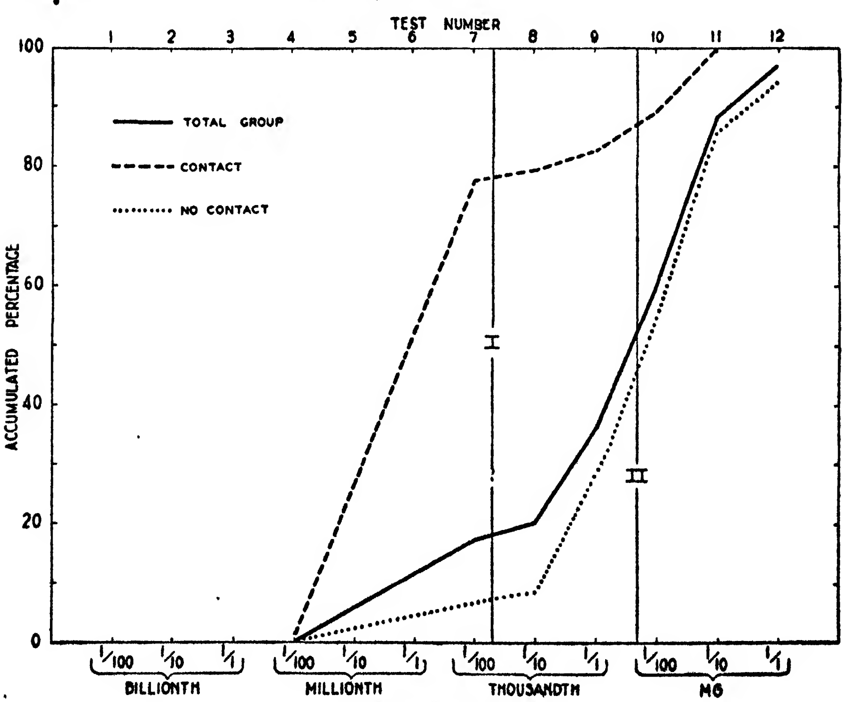

FIGURE 2.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD, by history of contact with tuberculosis among 309 of the 553 boys and girls in an orphanage. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

Infants and young children: The possibility must be considered that most of the children in the orphanage had some unknown contact with the tubercle bacillus which would explain the fact that 96 percent of them reacted to tuberculin when large doses were injected. Therefore, it appeared desirable to test another group in which there was less likelihood of contact with tuberculosis. For this purpose infants and small children in two foundling homes were chosen. The numerical results are shown in table 4, and the "sensitivity curve" or accumulated percentage of positive reactors to the various test doses, in figure 3. Included for comparison in this figure is the sensitivity curve for the 248 children of the orphanage who had no known history of contact with tuberculosis (from fig. 2). Although there were no reactors to the smaller doses of tuberculin, most of the infants, including those under 6 months of age, reacted to the larger doses. Thus, a high percentage of children react to tuberculin if sufficiently large doses are injected. It is also seen from the figure that sensitivity to tuberculin tends to increase with age, the curve for the children aged 4 to 6 years approaching the curve for those children aged 6 to 19 years who had no known history of contact with tuberculosis. As age increases, however, the opportunities for unknown contact with the tubercle bacillus also increase.

TABLE 4.—*Number and percentage of infants and young children positive [1] to various test doses of tuberculin PPD among 116 white boys and girls from birth through 6 years of age in 2 foundling homes*

Test No.	Tuberculin PPD, test dose in mg.	(1) 32 infants under 6 months of age			(2) 65 children aged 6 months through 3 years			(3) 19 children aged 4 through 6 years		
		Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)	------	------	------	------	------	------	------	------	------
2	0.0000000001 (1/10 billionth)	------	------	------	------	------	------	------	------	------
3	0.000000001 (1/1 billionth)	------	------	------	------	------	------	------	------	------
4	0.00000001 (1/100 millionth)	------	------	------	------	------	------	------	------	------
5	0.0000001 (1/10 millionth)	------	------	------	------	------	---	------	------	------
6	0.000001 (1/1 millionth)	------	------	------	------	------	------	------	------	------
7	0.00001 (1/100 thousandth)	0	0	0	0	0	0	0	0	0
8	0.0001 (1/10 thousandth)	0	0	0	0	0	0	1	1	5.3
9	0.001 (1/1 thousandth)	0	0	0	0	0	0	1	2	10.5
10	0.01 (1/100th)	0	0	0	9	9	13.8	4	6	31.6
11	0.1 (1/10th)	7	7	21.9	39	48	73.8	9	15	78.9
12	1.0 (1 mg.)	16	[4] 23	71.9	14	[5] 62	95.4	3	[6] 18	94.7

[1] Positive = edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there were 9 cases which were negative to all tests.
[5] In addition there were 3 cases which were negative to all tests.
[6] In addition there was 1 case which was negative to all tests.

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Tuberculous and contact groups.—Children: In table 5 and figure 4 are presented the sensitivity curves of three groups of children: (1) Those with active tuberculosis; (2) those who were healed cases or who had a history of known contact (preventorium); and (3) those in an antituberculosis camp, 60 percent of whom were reported to have a history of contact with tuberculosis.

It is seen that the sensitivity of the various groups of children to tuberculin increases with the proportion of persons in the group who

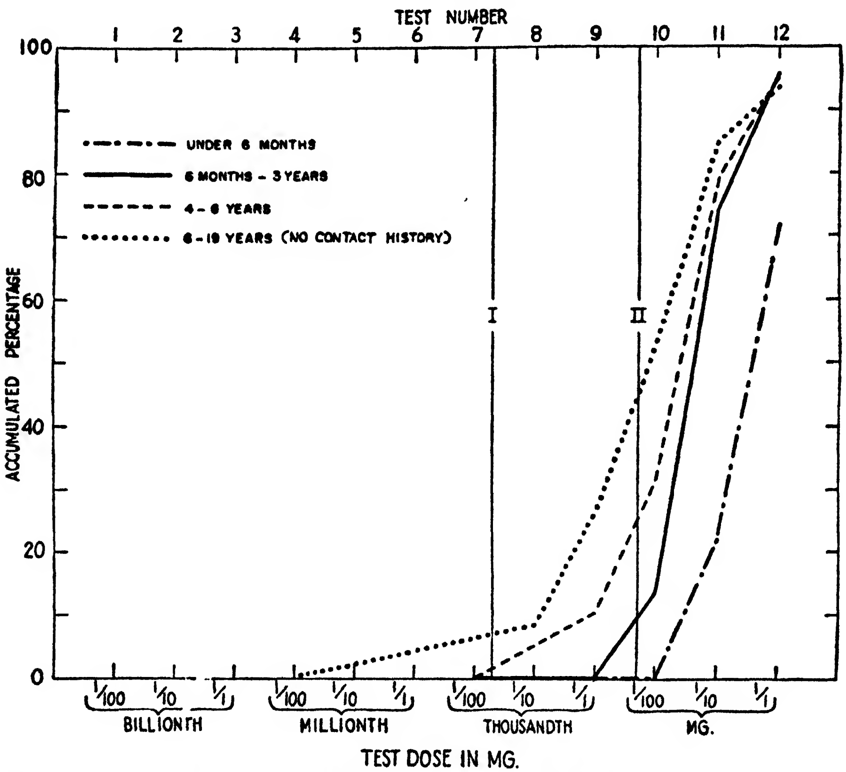

FIGURE 3.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 116 infants and young children aged from birth through 6 years, and 248 older children who had no known history of contact with tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

have had known contact with tuberculosis. Thus, the children in the antituberculosis camp, 60 percent of whom had a history of contact, are more sensitive than those of the orphanage group, of whom 20 percent had a history of contact. The children of the preventorium, all of whom were known contacts, have a higher percentage of reactors to the lower test doses. This sensitivity to the lower doses is even more marked among the children with active tuberculosis, approximately 95 percent of whom react at a level of dosage equivalent to the usual first testing dose of PPD and all of

whom reacted at a dosage level only five times as concentrated, or test number 8 (1/10,000 mg.). In contrast, only 20 percent of the orphanage group and 42 percent of the children in the antituberculosis camp had reactions to this testing dose.

TABLE 5.—*Number and percent of positive [1] reactors to various test doses of tuberculin PPD among 207 white and colored children from birth through 14 years of age with variable tuberculosis background. Tabulated separately are 60 children with active tuberculosis, 46 children who were contacts or healed cases of tuberculosis, and 101 children who were suspected of contact with tuberculosis*

Test No.	Tuberculin PPD, test dose in mg.	60 children with active tuberculosis			46 children in a preventorium			101 children in an antituberculosis camp		
		Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive	Number positive [1] reactors	Accumulated number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)	-----	-----	-----	0	0	0	0	0	0
2	0.0000000001 (1/10 billionth)	-----	-----	-----	-----	-----	-----	-----	-----	-----
3	0.000000001 (1/1 billionth)	2	2	3.3	-----	-----	-----	-----	-----	-----
4	0.00000001 (1/100 millionth)	7	9	15.0	7	7	15.2	0	0	0
5	0.0000001 (1/10 millionth	4	13	21.7	-----	-----	-----	-----	-----	-----
6	0.000001 (1/1 millionth)	26	39	65.0	21	28	60.9	9	9	8.9
7	0.00001 (1/100 thousandth)	17	56	93.3	5	33	71.7	17	26	25.7
8	0.0001 (1/10 thousandth)	4	60	100.0	2	35	76.1	16	42	41.6
9	0.001 (1/1 thousandth)	-----	-----	-----	1	36	78.3	12	54	53.5
10	0.01 (1/100th)	-----	-----	-----	3	39	84.8	19	73	72.3
11	0.1 (1/10th)	-----	-----	-----	4	43	93.5	18	91	90.1
12	1.0 (1 mg.)	-----	-----	-----	3	46	100.0	9	[4] 100	99.0

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.
[4] In addition there was 1 case which was negative to all tests.

Adults: Table 6 shows the data for 468 tuberculous adults and figure 5 illustrates their sensitivity curve. Included in this figure are the sensitivity curves for the tuberculous children (from fig. 4) and for the total orphanage group (from fig. 1). The similarity of the curves for the tuberculous adults and children is seen in figure 5. This is further evidence that reactions to small doses of tuberculin, or skin hypersensitivity, occur with great regularity in persons with active tuberculosis. The adults are seen to be slightly less sensitive than the children. For example, 84 percent of the adults had reactions to test number 7 (1/100,000 mg.) and 99.6 percent to test number 8 (1/10,000 mg.), whereas 93 percent of the children had reactions to the first of these two doses and 100 percent to the second.

In table 7 is shown the distribution, according to sex and race, of far advanced, moderately advanced, and minimal tuberculosis, respectively, in the 468 adults. While there were very few patients with minimal tuberculosis, no significant difference was found in their sensitivity to tuberculin in comparison with those who had either moderately or far advanced tuberculosis. Furthermore, there were

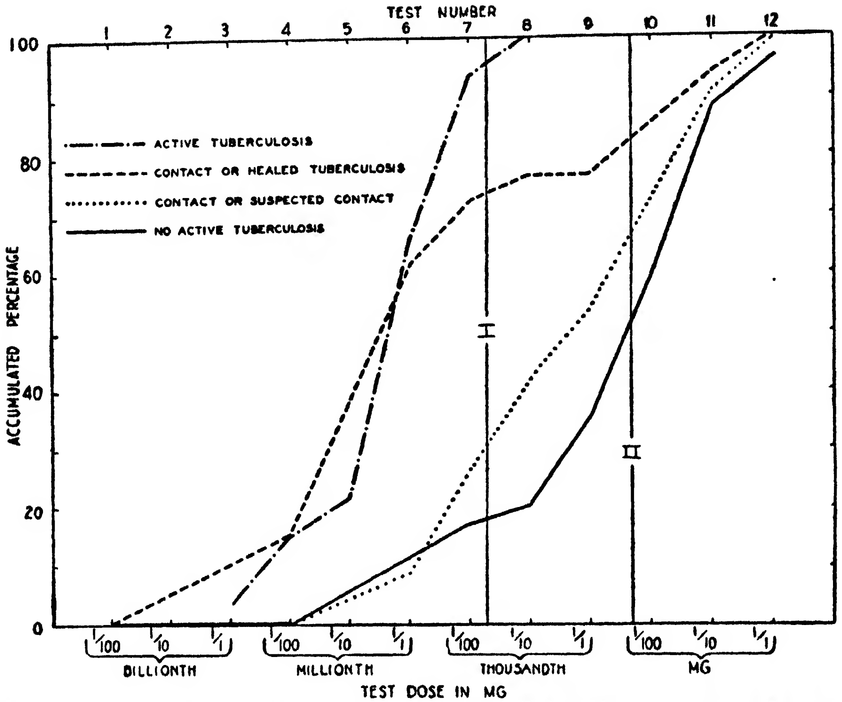

FIGURE 4.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 60 children with active tuberculosis, 46 children with healed or contact tuberculosis, 101 children contacts or suspected contacts, and 553 orphanage children with no apparent active tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

no differences in sensitivity to tuberculin when the data were analyzed from the standpoint of race, sex, and age of the patients. Progressive disease and fever appeared to cause a slight decrease in the sensitivity to tuberculin. The data on tuberculin sensitivity in cases of tuberculosis will be published later in more detail.

TABLE 6.—*Number and percentage of positive [1] reactors to various test doses of tuberculin PPD among 468 adult white and colored tuberculous patients of both sexes, aged 15–70 years*

Test No.	Tuberculin PPD, test dose in mg.	Number positive [1] reactors	Accumulatd number [2] positive	Accumulated percentage [3] positive
1	0.00000000001 (1/100 billionth)			
2	0 0000000001 (1/10 billionth)			
3	0.000000001 (1/1 billionth)	23	23	4.9
4	0.00000001 (1/100 millionth)	32	55	11.8
5	0.0000001 (1/10 millionth)	47	102	21.8
6	0.000001 (1/1 millionth)	148	250	53.4
7	0.00001 (1/100 thousandth)	142	392	83.8
8	0.0001 (1/10 thousandth)	74	466	99 6
9	0.001 (1/1 thousandth)	0	466	99 6
10	0.01 (1/100th)	2	468	100.0
11				
12				

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of children tested.

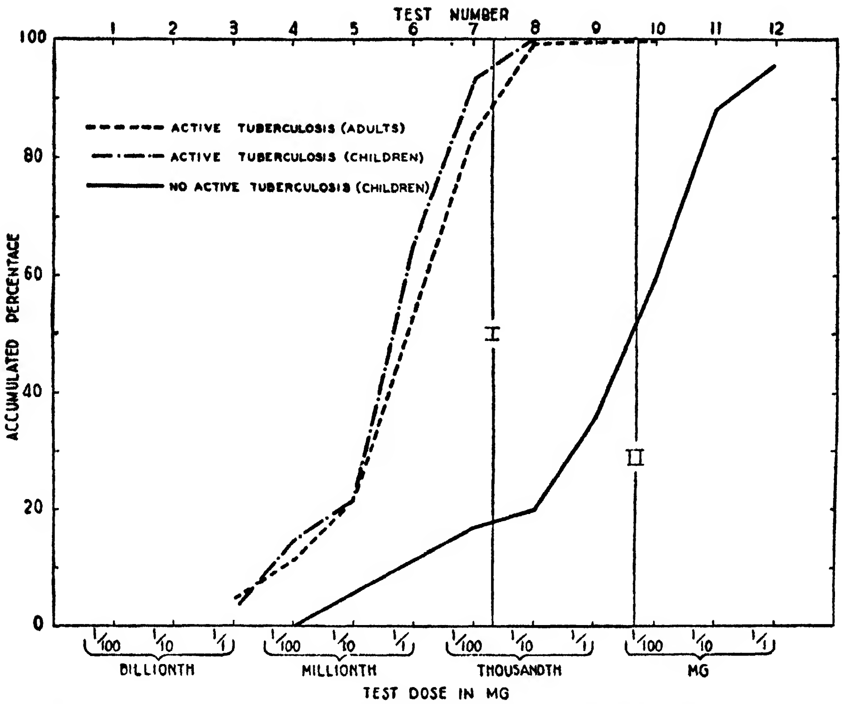

FIGURE 5.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 468 adults with active tuberculosis, 60 children with active tuberculosis, and 553 orphanage children with no apparent active tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended.

TABLE 7.—*Number and percentage distribution by race and sex of 468 adult cases of tuberculosis as to the type or stage of their tuberculosis*

Type or stage of tuberculous disease	White				Colored			
	Male		Female		Male		Female	
	Number of cases	Percent	Number of cases	Percent	Number of cases	Percent	Number of cases	Percent
All cases	175	100.0	136	100.0	84	100.0	73	100.0
Far advanced	154	88.0	88	64.7	61	72.6	50	68.5
Moderately advanced	13	7.4	35	25.7	11	13.1	10	13.7
Minimal	4	2.3	13	9.6	1	1.2	3	4.1
Pleurisy	4	2.3	-------	-------	4	4.8	10	13.7
Childhood type	-------	-------	-------	-------	1	1.2	-------	-------
Extra pulmonary only	-------	-------	-------	-------	6	7.1	-------	-------

The results of the testing of 499 patients in a hospital for the insane are shown in table 8 and figure 6. Shown also in the figure are the sensitivity curves for the adults with active tuberculosis (from fig. 5) and the children of the orphanage (from fig. 1). It is seen that this group of patients is not as sensitive to tuberculin as are active cases of tuberculosis but is far more sensitive than the children in the orphanage, none of whom had active tuberculosis.

TABLE 8.—*Number and percent of positive[1] reactors to various test doses of tuberculin PPD among 499 white and colored male adults aged 15–60 years in a mental hospital where the incidence of active tubercu'osis was very high*

Test No.	Tuberculin PPD, test dose in mg.	Number positive[1] reactors	Accumulated number[2] positive	Accumulated percentage[3] positive
1	0.00000000001 (1/100 billionth)			
2	0.0000000001(1/10 billionth)			
3	0.000000001(1/1 billionth)	0	0	0
4	0.00000001(1/100 millionth)			
5	0.0000001(1/10 millionth)	23	23	4.6
6	0.000001(1/1 millionth)			
7	0.00001(1/100 thousandth)	357	380	76.2
8	0.0001(1/10 thousandth)	97	477	95.6
9	0 001(1/1 thousandth)	8	485	97.2
10	0.01(1/100th)	[4] 3	488	98.2
11	0.1(1/10th)	[4] 3	491	98.8
12	1.0(1 mg.)	[4] 4	[5] 495	99.6

(Tests 10, 11, and 12 are based on 497 individuals instead of 499 owing to the fact that two were not tested.

[1] Positive=edematous reaction measuring 5 mm. or more in mean diameter at 48 hours.
[2] The accumulated number positive to a given dose includes the total number of positive reactors to that dose and to all lower doses.
[3] Using as 100 percent the total number of individuals tested.
[4] Two cases were not tested with tests 10, 11, and 12.
[5] In addition there were 2 cases which were negative to all tests.

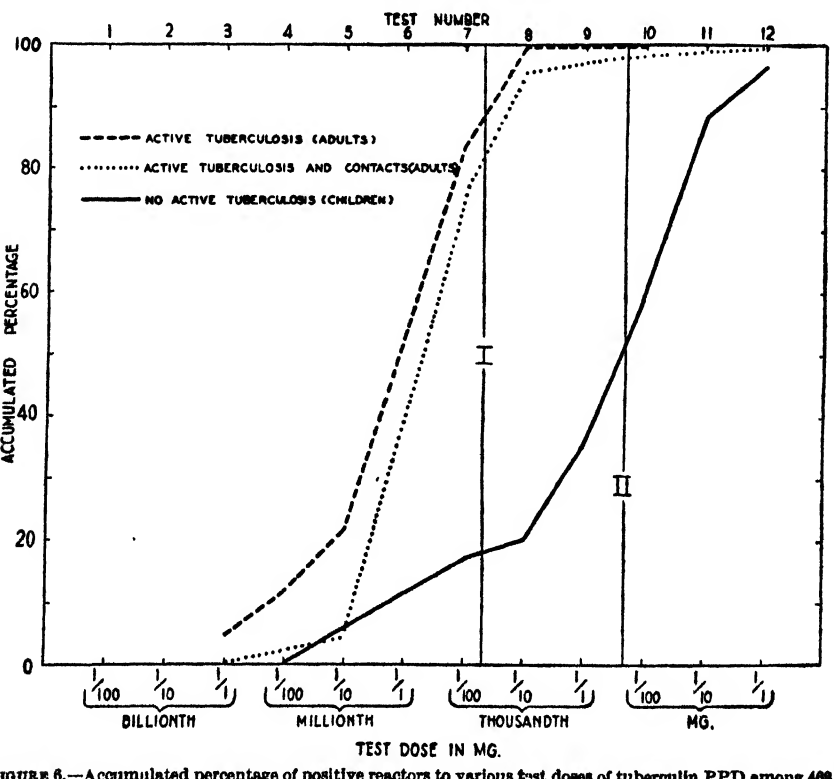

FIGURE 6.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among 468 adults with active tuberculosis, 499 adults in a mental hospital (with a high incidence of active tuberculosis), and 553 orphanage children with no apparent active tuberculosis. . The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg.) strength doses of PPD as usually recommended

DISCUSSION

It is evident from the data presented that the quantitative titration of tuberculin sensitivity by the use of doses of different concentration yields information which throws considerable light on the interpretation of the reaction. When the tuberculin sensitivity of each individual making up a population group is known, it is possible to construct a curve of tuberculin sensitivity for the group. When the same tuberculin solution and testing technique are used throughout, it is possible to compare the curves of tuberculin sensitivity of various population groups. In view of the known variations in the potency of different tuberculin products it must, however, be emphasized that the results in this study apply only to the single lot of PPD employed (number 98970). While it is probable that the general pattern of the sensitivity curves for any particular group would be quite similar for different lots or for different types of tuberculin, the responses at specific dosage levels might vary considerably. For this reason in recording skin reactions to tuberculin it is important to specify the type as well as the dose of tuberculin injected.

In figure 7 are presented the sensitivity curves of all the population groups tested. It is apparent that (1) almost all persons tested react to tuberculin if large enough doses are injected, and (2) that certain persons react to very small doses of tuberculin. In the main, those who reacted only to large doses of tuberculin were those who had no known contact with the tubercle bacillus. Conversely, the majority of those who reacted to the very small doses either had tuberculosis or had a history of contact with it.

Thus, the members of those groups in which there was no known contact with the tubercle bacillus (lines 4, 5, 6, and 3) are relatively insensitive to tuberculin, that is, large doses of tuberculin were required before there were any reactions. In addition, age seems to play a part in the reactions of those persons with no known contact. Evidence of the increasing sensitivity with age is reflected by the fact that the steep rise in the sensitivity curves does not begin until after test number 10 (1/100 mg.) for the youngest children (line 4) while it begins after test number 8 (1/10,000 mg.) for the older noncontact children (line 3). Of course, as age increases so does the possibility of unknown contact with the tubercle bacillus.

The sensitivity curves of those groups, all of whose members had a history of contact or actual tuberculous disease, differed markedly from the foregoing, owing primarily to a greater percentage of reactors to the smaller test doses. These differences may be illustrated by comparing the percentage of persons who react to test number 8 (1/10,000 mg.) among the various groups. In the following

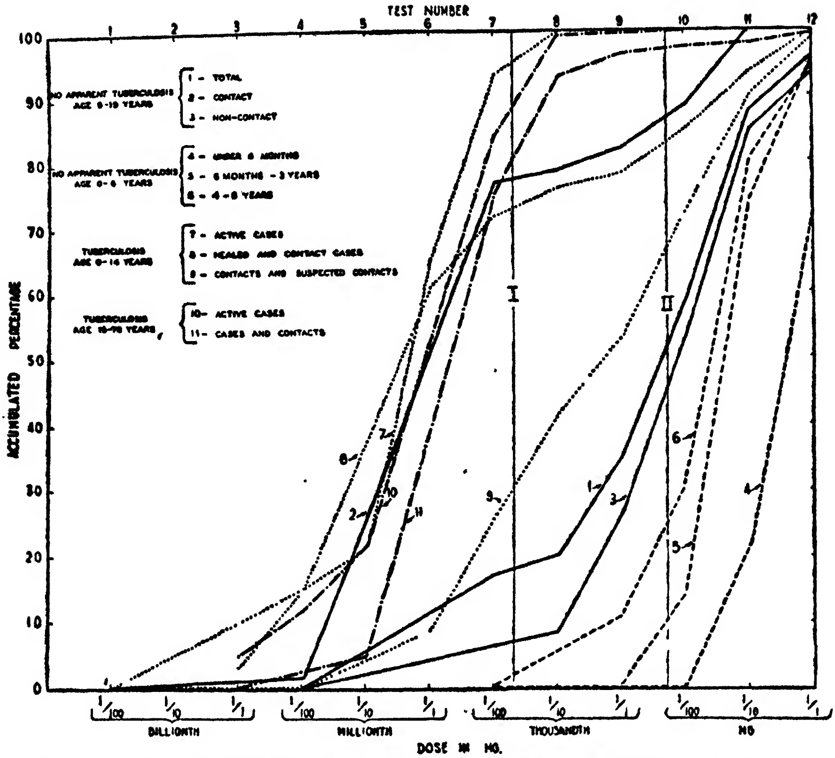

FIGURE 7.—Accumulated percentage of positive reactors to various test doses of tuberculin PPD among different population groups with different degrees of contact with tuberculosis. The vertical lines, marked I and II, represent the approximate level of the first (0.00002 mg.) and second (0.005 mg) strength doses of PPD as usually recommended.

table the proportion reacting to this test among the various groups is shown in descending order.

Group	Line number in figure 7	Percentage positive to test number 8	Proportion of group who had contact with tubercle bacillus and type of contact
Tuberculous children	7	100	All (active tuberculosis).
Tuberculous adults	10	99	Do.
Mentally ill patients	11	96	Presumably all (10 percent have active tuberculosis and remainder are in intimate contact with them).
Orphanage "contacts," or children with history of contact with tuberculosis.	2	79	Presumably all (history of family contact).
Preventorium	8	76	Presumably all (history of previous infection or of contact).

It is evident from a study of the table that this arrangement in descending order of tuberculin sensitivity also arranges the groups by the certainty of tuberculous infection. Thus the greatest percentage of reactors is found among the tuberculous cases, who are obviously the most certainly infected. Somewhat fewer reactors are found

among the patients in the hospital for the insane, 10 percent of whom were active cases and the remainder in close contact with them and probably infected. Among the two groups, all the members of which were contacts by history only, it is seen that 79 and 76 percent reacted. This finding, that all persons with a history of contact do not react to low doses of tuberculin, is in agreement with the findings of others (*5*). Three possible explanations of this failure of persons with a history of contact to react to small doses of tuberculin must be considered: (1) That these persons had been infected with the tubercle bacillus and had either not become hypersensitive, or having once been hypersensitive to tuberculin, had subsequently become anergic; (2) that, although they had lived in homes or institutions where there was open tuberculosis, they had not been infected; or (3) that the history of tuberculous contact was incorrect. Obviously, history of contact with tuberculosis is not always reliable, and there are reasons to assume that reactions to small doses of tuberculin are a more adequate measure of tuberculous infection than merely history of contact. On the basis of such an assumption it would be interpreted that the 8.5 percent of the noncontact group (line 3, fig. 7), who had positive reactions to test number 8 had had effective contact (or infection) with the tubercle bacillus, and, on the same basis, that the 21 percent of the contact group (line 2, fig. 7) who had no reaction to test number 8 probably had not had effective contact (or been infected) with the tubercle bacillus.

The two remaining curves (lines 9 and 1, fig. 7) represent groups part of whom had a history of contact and part of whom did not. They thus might be considered to be made up of different proportions of persons from the hypersensitive (or infected) group and the insensitive (or noninfected) group. Their sensitivity curve would then be intermediate between the two extremes of sensitive and insensitive, tending to resemble more those groups from which a majority of their members were drawn. Thus the children of the total orphanage group, of whom 20 percent had a history of contact with tuberculosis, had 20 percent of reactors to test number 8 (1/10,000 mg.) while the children of the antituberculosis camp, 60 percent of whom had a history of contact, had 42 percent reactors to this test dose.

The exact significance of skin reactions which are obtained only to large doses of tuberculin is not clear. There are reasons, however, which make it appear likely that these reactions are nonspecific or, in other words, that they are not due to infection with the tubercle bacillus. In the first place, since almost everyone reacted, if these reactions were specific it would be necessary to assume that almost all persons tested, even very young infants, had been infected with the tubercle bacillus. Such an assumption seems unwarranted. In the second place, the character of the reaction to the larger doses of tuber-

culin was different from that to the smaller doses. This statement is made without further elaboration since these differences will be described in detail in a subsequent publication. In the third place, reactions to the larger doses of tuberculin were much less stable over a period of time than were reactions to the smaller doses. This finding (to be reported in detail later) is supported by the work of Dahlstrom (*6*) who reports that 60 percent of reactors to the usual second testing dose of tuberculin reverted from positive to negative over a period of years compared to less than 4 percent of the reactors to the usual first testing dose.

If the assumption is correct that reactions occurring with large doses of tuberculin are not specific, then it becomes important to determine if possible at what dose of tuberculin the nonspecific character becomes evident. It would appear likely that the nonspecific effect, if such occurs, must not become evident at any one dose but must be manifest to a number of doses. This hypothesis is supported by the fact that the sharp upward trend of the curves suggestive of nonspecificity does not begin at the same dosage level in all of the noncontact groups. However, the fact that the nonspecificity increases as the dosage of tuberculin is increased is an added argument for limiting the dosage of tuberculin to an amount not greater than 1/10,000 mg. (test number 8), at which dosage level the element of nonspecificity, if it does occur, does not appear to be of great significance.

It is necessary to consider the possibility that the children who received multiple injections of tuberculin but who had skin reactions only to the larger doses of tuberculin (tests 11 and 12) may have been sensitized by the tuberculin injected in the preceding tests (*9*). Several experimental procedures were carried out to test this possibility. In no instance was there evidence to suggest that sensitivity to tuberculin had been induced by the injection of tuberculin. The details of this portion of the study will be reported separately.

From these observations it appears that most persons with tuberculosis react to a relatively small dose of tuberculin (about 1/10000 mg. of the PPD used in this study). In our experience with over 500 cases of tuberculosis more than 99 percent reacted to this dose, which is five times more concentrated than the usual first testing dose of PPD. Similar findings are reported by Long (*7*) on 609 cases of tuberculosis from the Phipps Clinic; 94 percent of the white and 96 percent of the colored reacted to the first testing strength of OT or PPD. A large proportion of persons in intimate contact with active tuberculosis will also react to this dose. If larger doses are used it should be with the realization that they may invoke what are probably "nonspecific" reactions, and that such reactions occur with increasing frequency as the dosage is increased.

SUMMARY

1. A quantitative method of titrating sensitivity to tuberculin is presented.

2. This method was applied to various population groups and the resultant "curves of sensitivity" to tuberculin are compared.

3. It is demonstrated that contact with the tubercle bacillus markedly increases sensitivity to tuberculin in most cases.

4. The tuberculin sensitivity of patients suffering from active tuberculosis is so extreme that these persons may be detected by the use of small doses of tuberculin, in the neighborhood of 1/10,000 of a milligram, of the particular PPD employed in this study.

5. It is demonstrated that almost all persons tested will react if sufficiently large doses of tuberculin are given.

6. Patients with active tuberculosis, both adults and children, who are anergic to tuberculin were not encountered in this study. Slight depression of tuberculin sensitivity occurred in only 2 out of 528 cases.

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MORBIDITY AND MORTALITY DURING 1940 AND RECENT PRECEDING YEARS

MORBIDITY

The following data concerning the prevalence of eight communicable diseases are based on reports submitted by the health officers of the several States and the District of Columbia (table 1). Although cases of each of these diseases are reportable by law, there is considerable variability in the completeness of the reports. The number of cases reported is somewhat smaller than the number of cases which occurs during any given year, but it is believed that the reports are sufficiently accurate to reveal any unusual prevalence arising from an epidemic.

Diseases above the median prevalence.—The numbers of reported cases of influenza and poliomyelitis in 1940 were 57 percent and 33 percent greater, respectively, than the corresponding median numbers for the 5-year period 1935–39. The minor epidemic of influenza which occurred during the first few weeks of 1940 began during the latter part of November 1939 in the Southern States and in the Mountain States of the West. Unlike the outbreaks of recent years the peak was reached relatively early in the winter, around the first of February 1940, after which the number of cases decreased rapidly (fig. 1).

TABLE 1.—*Number of reported cases of certain communicable diseases in the United States in 1939 and 1940 and the median number of cases reported for 1935–39*

Disease	1940		1939		Median 1935-39	
	Cases	Number of States reporting	Cases	Number of States reporting	Cases	Number of States reporting
Diphtheria	15,515	48	24,053	48	30,018	48
Influenza [1]	426,851	42	271,771	42	271,771	42
Measles	290,474	48	403,317	48	403,317	48
Meningitis, meningococcus [2]	1,645	44	1,967	44	5,484	44
Poliomyelitis	9,795	48	7,343	48	7,343	48
Scarlet fever	155,443	48	162,897	48	228,887	48
Smallpox	2,795	48	9,877	48	9,877	48
Typhoid and paratyphoid fever	9,801	48	13,069	48	15,898	48

[1] New Hampshire, Massachusetts, New York, Pennsylvania, Michigan, and Colorado are omitted.
[2] New Hampshire, Vermont, South Carolina, and Nevada are omitted.

Figures for 1940 are preliminary.

A much more severe epidemic began in November 1940 in Arizona and California and rapidly spread eastward across the southern part of the country. The peak was reached during the latter part of January 1941, with the number of cases more than 6 times the corresponding number reported at the peak in February 1940. During the entire year the prevalence of influenza was relatively low in the Northeastern and North Central States.

The number of cases of poliomyelitis reported during 1940 was the largest since 1935 (fig. 2). This disease was unusually prevalent throughout the North Central States and to a lesser extent in the

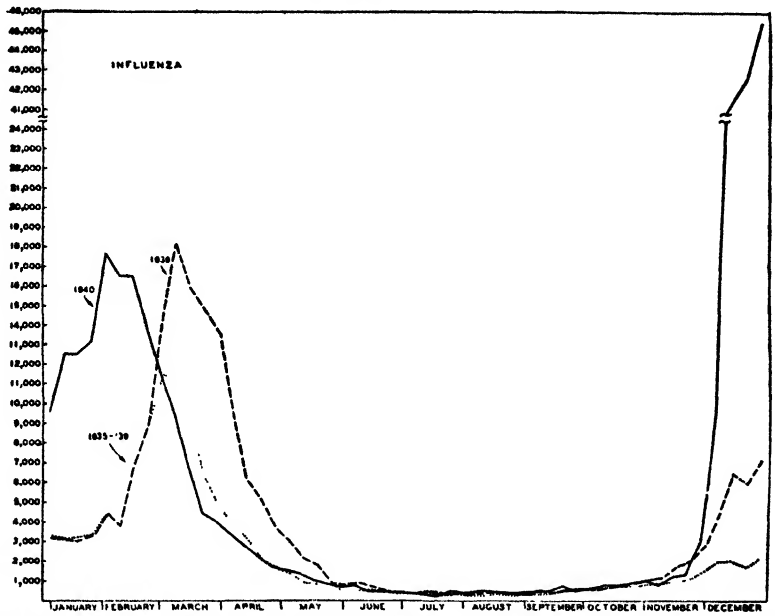

FIGURE 1.—Number of reported cases of influenza by weeks for 1940, 1939, and the median number for 1935-39.

Pacific Coast States. The New England and Middle Atlantic States reported relatively few cases of poliomyelitis during 1940.

Diseases below the median prevalence.—The numbers of reported cases of diphtheria, smallpox, and typhoid fever for 1940 were the lowest on record (figs. 3, 4, 5). The number of cases of diphtheria was only about one-half the median number for 1935–39. The decline in the number of reported cases of smallpox was even greater, the number of cases for 1940 being only 28 percent of the preceding 5-year median. As usual, the prevalence was relatively highest in the West North Central, and Mountain States. In contrast, no cases were reported from the New England and Middle Atlantic States.

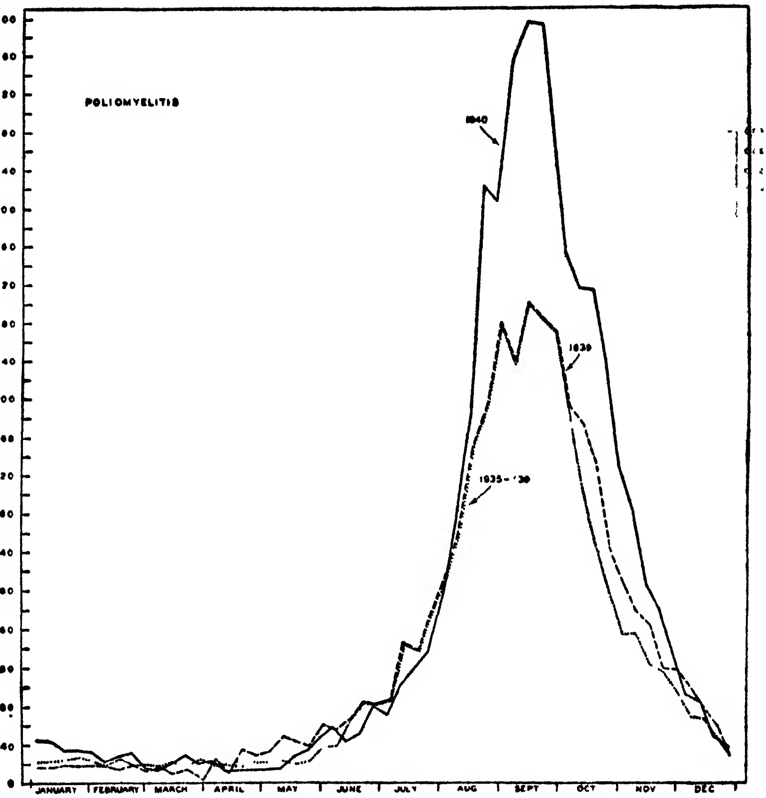

FIGURE 2.—Number of reported cases of poliomyelitis for 1940, 1939, and the median number for 1935-39

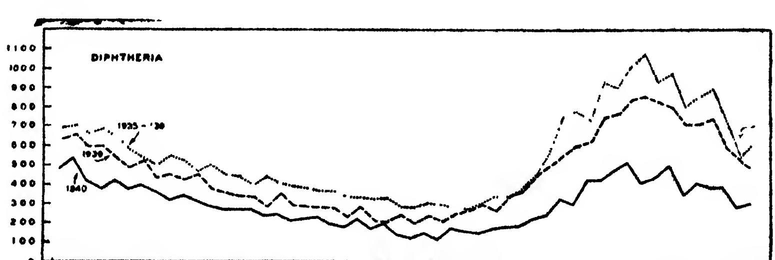

FIGURE 3.—Number of reported cases of diphtheria by weeks for 1940, 1939, and the median number for 1935-39.

Even though the number of cases of smallpox in 1940 was the lowest on record it is still unnecessarily large for a disease which can be practically eliminated by well-known methods of control. The numbers of reported cases of measles, meningococcus meningitis, scarlet fever, and typhoid fever were all less than the numbers reported during 1939, as well as the median number for the 5-year period 1935–39.

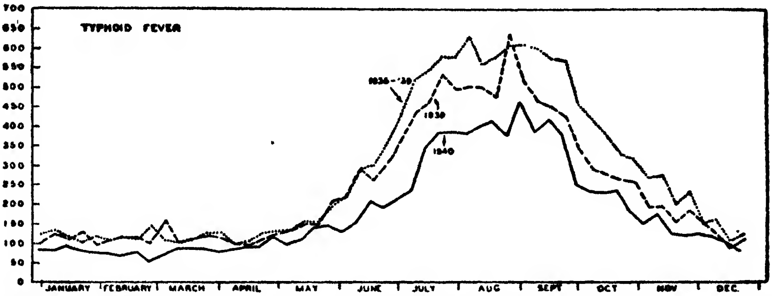

FIGURE 4.—Number of reported cases of typhoid fever by weeks for 1940, 1939, and the median number for 1935–39.

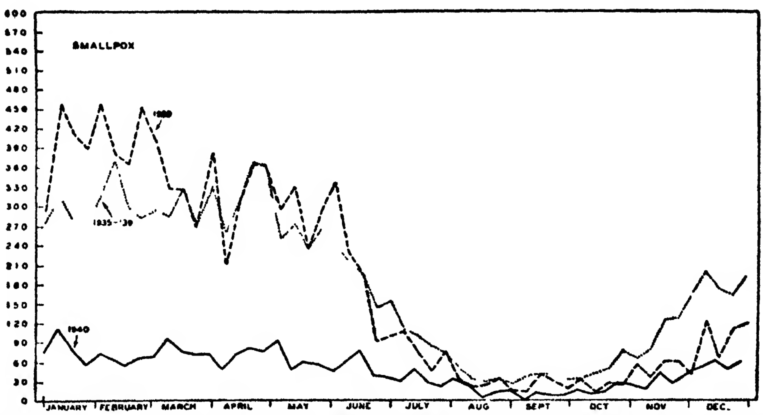

FIGURE 5.—Number of reported cases of smallpox by weeks for 1940, 1939, and the median number for 1935–39.

MORTALITY

The mortality rates in table 2 are based on preliminary data for 40 States and the District of Columbia. In addition, comparative mortality rates by quarters for the past 3 years are shown in table 3 for 38 States and the District of Columbia. Death rates for 1940 for 45 individual States, the District of Columbia, Alaska, and Hawaii are presented in tables 4 and 5.

This report is made possible through a cooperative arrangement with the respective States which voluntarily furnish provisional tabulations of current birth and death records to the United States Public

Health Service which provides for the publication of the data received. Because of lack of uniformity in the method of classifying deaths according to cause, and the impossibility of including a certain number of delayed certificates, these data are preliminary and may differ in some instances from the final figures subsequently published by the Bureau of the Census.

Data for preceding years from the same source, collected and tabulated in the same way as the current data, are included for comparative purposes. The figures are used in preference to the final figures

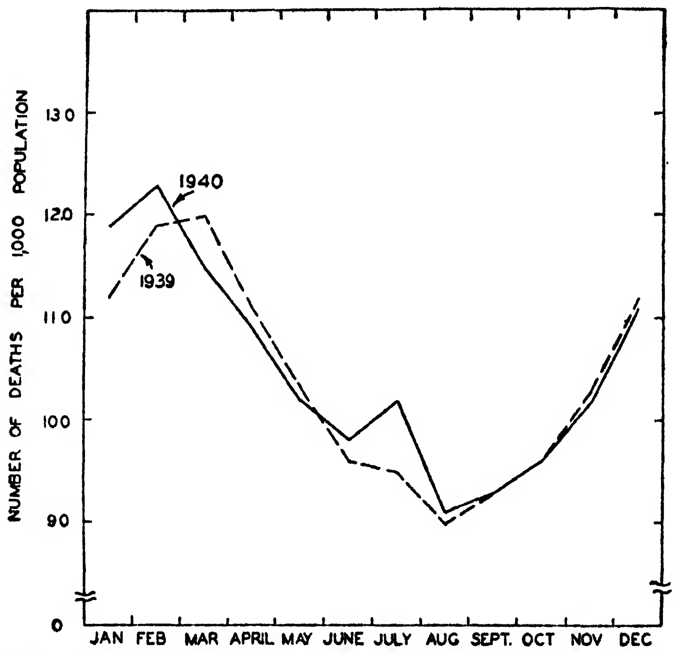

FIGURE 6.—Number of deaths per 1,000 estimated population by months for 1939 and 1940.

published by the Bureau of the Census because it is believed that they are more comparable with current provisional information.

In the past these preliminary reports have provided an early accurate index of the trend of mortality for the country as a whole. Some deviation from the final figures for individual States may be expected because of the provisional nature of the reports. It is believed, however, that the trend of mortality within each State is correctly represented. Comparisons of specific causes of death among the States are subject to some error because of differences in tabulation procedure and completeness of reporting. Comparisons of this nature should be made only from the final figures published by the Bureau of the Census.

Preliminary reports indicate that the death rate from all causes was about 1 percent higher in 1940 than in 1939, but since the rate in 1939 was the lowest reported in the history of the registration area the record for 1940 must be regarded as very favorable. One-half of the States for which comparable data are available reported a death rate as low or lower in 1940 than that for 1939.

Diseases with lower death rates.—A lower death rate in 1940 than in 1939 was reported for each of the acute diseases, which are shown separately in table 2, except poliomyelitis and acute infectious encephalitis, each of which is relatively unimportant as a cause of death. Especially noteworthy is the low mortality rate for influenza and pneumonia in spite of the minor epidemic of influenza during the first part of the year and the more severe epidemic which started during the latter part of November. The relative number of fatal pneumonia cases has rapidly declined since the discovery and use of serum and chemotherapy, the death rate during 1940 being only 58 percent of that for 1936. Only 6 of the 41 States for which data are available reported a higher rate in 1940 than in 1939.

The four principal communicable diseases of early childhood—diphtheria, measles, scarlet fever, and whooping cough—were responsible for about 25 percent fewer deaths in 1940 than in the previous year. Although the mortality rate from these diseases is now very low, a continued decline in the rate is very gratifying.

Thirty-one of the 41 States reported a lower mortality from tuberculosis than in 1939. The death rate for the entire group of States has declined 18 percent since 1936.

The maternal mortality rate declined for the eleventh consecutive year. Only 15 of the 41 States reported an increase in the rate over 1939; for the entire group the rate during 1940 was only about two-thirds of that for 1936.

Other diseases causing a lower mortality in 1940 than in 1939 were typhoid fever, malaria, pellagra, digestive disorders, and diarrhea and enteritis.

Diseases with higher death rates.—Poliomyelitis and encephalitis were the only acute diseases which caused relatively more deaths in 1940 than in 1939. Except for the second quarter of the year, fatal cases of poliomyelitis were more numerous than during the corresponding period of the previous years. However, most of the increase resulted from the minor epidemic which occurred during the latter half of the year.

The gain during the 2 previous years in lowering the death rate from automobile accidents was completely wiped out in 1940. At the same time the relative number of other fatal accidents also increased. These increases, in part at least, reflect increased industrial activity

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and improved economic conditions. Thirty-three of the 41 States reported more fatal automobile accidents than in 1939.

The important chronic diseases of late adult life and old age—cancer, cerebral hemorrhage, diabetes, heart disease, and nephritis—accounted for a larger proportion of the total number of deaths in 1940 than in the previous year.

BIRTH RATE AND INFANT MORTALITY RATE

Only 10 States reported an increased infant mortality rate. Although the amount of decrease for the entire group of States was less than that for recent years the rate for 1940 was 16 percent less than the rate for 1936.

There was a widespread increase in the birth rate during 1940. Thirty-three of the 38 reporting States had a higher rate than in 1939. As a result, the crude rate of natural increase for 1940 was 6.8 per 1,000 population as compared with 6.4 per 1,000 population for 1939.

TABLE 2.—*Summary of mortality trends from certain causes in a group of 41 States, 1936–40* [1] *(estimated population July 1, 1940, 112,590,000)*

[Rates provisional for all years]

Diseases (numbers in parentheses are from the International List of Causes of Death, revised February 1940 for 1938 International List)	1940	1939	1938	1937	1936
	Rate per 1,000 population				
Deaths, all causes	10 5	10 4	10 4	11 0	11 4
Births, exclusive of stillbirths	17 6	17 1	17 6	17 1	16 8
	Rate per 1,000 live births				
Infant mortality (live births, 1940, 1,977,591)	47	48	50	54	56
Maternal mortality	3.6	3 8	4 2	4 7	5 5
	Rate per 100,000 population				
Typhoid and paratyphoid fever (1, 2)	1 0	1.5	1.8	2.0	2 3
Cerebrospinal (meningococcus) meningitis (6)	.5	.5	.7	1.6	2 3
Scarlet fever (8)	.5	7	.9	1.4	2 0
Whooping cough (9)	2 1	2.3	3.5	3 6	2 1
Diphtheria (10)	1 0	1.5	1 9	2.0	2 3
Tuberculosis, all forms (13-22)	43 8	45 0	47.0	51 3	53 3
Malaria (28)	8	1.0	1 5	1 8	2 8
Influenza (grippe) (33)	14.8	16.4	12 4	20.1	25.2
Measles (35)	.5	.9	2 3	1.0	.8
Acute poliomyelitis and acute polioencephalitis (36)	.7	.5	.4	1.0	.5
Acute infectious encephalitis (lethargic) (37)	.5	.4	.5	.6	.6
Cancer and other malignant tumors (45-55)	117 8	114.4	113.0	108.1	109.5
Diabetes mellitus (61)	26 4	25 4	23.8	23.7	23 9
Pellagra (except alcoholic) (69)	1.4	1.7	2 3	2 4	3.2
Cerebral hemorrhage, embolism, and thrombosis (83a, b)	89 5	85.7	83 4	84 4	88 4
Diseases of the heart (90-95)	288 9	276 2	266.7	258.8	261 6
Pneumonia, all forms (107-109)	53 5	58.5	66.4	84.2	92.1
Diseases of the digestive system (115-129)	56 3	58 6	61.9	64.7	68.5
Diarrhea and enteritis under 2 years (119)	7.1	8.0	10.3	10 6	11.4
Nephritis, all forms (130-132)	76 4	72.2	75 0	77.5	81.6
All accidents, including automobile accidents (169-195)	70.3	68 5	69.6	78.9	83 9
Automobile accidents only (170 a, b, c)	24 3	22.7	23.1	28.4	28.3

[1] The States included are all of those except Alabama and Washington listed in tables 4 and 5 that have data for the 5 years included. The District of Columbia is counted as a State.

TABLE 3.—*Trends of mortality from certain causes in each quarter of 1940, 1939, and 1938 in the 39* [1] *States with available data (estimated population July 1, 1940, 103,971,900)*

[Rates provisional for all years]

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis, under 2 years (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, e)
January-December:																								
1940	10.6	17.4	45	3.5	0.9	0.5	0.5	1.9	0.9	43.0	13.6	0.3	0.7	0.5	121.3	27.5	91.6	298.5	53.8	54.8	5.6	77.0	70.4	24.3
1939	10.5	16.9	46	3.7	1.3	.5	.7	2.1	1.4	44.1	15.7	.8	.5	.4	118.4	26.5	87.6	285.6	58.9	58.3	6.8	73.0	69.1	22.7
1938	10.5	17.4	49	4.1	1.5	.7	1.0	3.3	1.7	45.7	11.3	2.3	.3	.6	116.5	24.8	84.6	270.9	65.2	61.8	9.3	75.7	69.6	22.9
January-March:																								
1940	12.0	16.1	52	4.0	.5	.7	.9	1.7	1.2	45.1	31.9	.4	.3	.5	122.1	32.4	103.2	312.9	86.3	53.3	4.2	88.0	66.5	19.2
1939	11.9	16.3	54	4.1	.8	.7	1.2	2.5	1.6	46.0	33.5	1.4	.1	.5	118.4	30.5	95.7	326.1	105.4	55.0	4.1	83.8	62.4	18.1
1938	11.3	16.6	52	4.4	.7	1.1	1.6	3.4	1.8	47.5	21.3	4.0	.3	.8	115.1	27.1	90.3	292.2	103.0	55.2	4.1	82.0	63.1	19.6
April-June:																								
1940	10.4	17.0	44	3.8	.6	.5	.5	1.8	.6	46.0	10.2	.5	.2	.6	119.9	26.4	90.4	298.2	47.6	52.7	3.1	77.9	65.4	21.2
1939	10.4	16.5	46	3.9	.8	.5	.7	2.3	.7	47.4	16.3	1.2	.3	.4	118.0	25.2	86.5	231.9	51.9	57.4	5.8	74.6	65.7	19.0
1938	10.4	17.0	50	4.3	1.1	.7	1.0	4.0	1.0	48.9	8.4	4.3	.3	.5	115.9	24.5	83.7	268.6	60.1	64.3	9.7	77.4	63.6	19.2
July-September:																								
1940	9.6	18.5	39	3.3	1.5	.3	.3	1.9	.6	41.2	3.1	.2	1.5	.6	121.4	23.8	82.7	258.1	28.4	69.7	8.8	68.1	75.7	25.7
1939	9.3	17.8	40	3.5	2.3	.4	.3	2.0	.9	41.2	3.3	.2	.9	.5	116.4	22.4	76.7	241.4	26.7	64.8	11.0	62.8	72.4	23.9
1938	9.6	18.2	46	3.9	2.5	.5	.5	3.5	1.2	44.0	4.1	.7	.4	.7	115.9	21.8	76.2	237.5	33.5	70.3	15.8	67.7	77.0	21.4
October-December:																								
1940	10.5	18.0	46	2.9	.8	.4	.4	2.3	1.3	39.8	9.6	.1	1.1	.5	122.0	27.3	90.1	295.3	53.1	52.6	6.3	74.1	74.0	30.9
1939	10.5	17.2	45	3.4	1.2	.4	.6	1.6	2.4	42.0	10.3	.2	.7	.4	120.8	26.9	90.6	293.7	52.5	55.9	6.3	71.1	75.8	29.9
1938	10.7	17.7	48	3.7	1.5	.6	.9	2.4	2.8	42.5	11.5	.4	.3	.5	119.0	25.8	88.5	255.8	69.1	57.2	7.5	75.6	74.4	28.3

See footnotes at end of table.

Table 3.—*Trends of mortality from certain causes in each quarter of 1940, 1939, and 1938 in the 39 States with available data (estimated population July 1, 1940, 103,971,900)*—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lathargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis, under 2 years (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, e)
Metropolitan Life Insurance Co., industrial policyholders (January-December): [2]																								
1940	7.6	------	------	------	0.7	------	0.6	1.2	0.8	44.3	7.9	0.3	------	------	103.5	29.5	60.8	[3]158.6	35.5	------	2.9	[4]56.6	46.7	[5]17.0
1939	7.6	------	------	------	.7	------	.7	1.6	1.3	45.2	9.9	.6	------	------	101.7	27.7	59.7	[3]161.0	42.8	------	3.7	[4]51.8	46.2	[5]17.3
1938	7.7	------	------	------	1.0	------	1.1	2.0	1.7	47.2	7.5	1.6	------	------	98.8	24.8	58.5	[3]154.0	50.6	------	5.3	[4]53.8	48.4	[5]17.6

[1] The States included are all of those except Alabama, Mississippi, Texas, and Washington listed in tables 4 and 5 that have data for the 3 years included. The District of Columbia is counted as a State.

[2] These data are taken from the Monthly Statistical Bulletin published by the Metropolitan Life Insurance Co. The figures are subject to correction, since they are based on provisional estimates of lives exposed to risk. Data do not include all diseases reported to the Public Health Service.

[3] Excludes pericarditis, acute endocarditis, and acute myocarditis.

[4] Chronic nephritis only.

[5] Excludes collisions between automobiles and railroad trains or street cars.

TABLE 4.—*Trend of death rates from all causes, of birth rates, and of infant and maternal mortality rates, 1936–40*

[Rates provisional for all years]

State	Deaths, all causes (rate per 1,000 population)					Births, exclusive of stillbirths (rate per 1,000 population)					Infant mortality (rate per 1,000 live births)					Maternal mortality (rate per 1,000 live births)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	10.2	10.2	10.7	11.2	11.3	22.3	22.3	22.5	22.2	22.1	62	60	61	63	66	6.1	5.8	6.2	5.9	6.7
California	(1)	11.3	11.4	12.2	11.8	(1)	15.2	14.5	14.3	13.1	(1)	42	46	54	53	(1)	3.0	3.5	4.2	4.7
Colorado	11.1	11.2	11.4	12.7	12.8	18.9	18.3	18.3	18.3	17.1	60	53	59	70	74	4.4	5.1	4.3	5.5	7.1
Connecticut	9.5	10.0	10.3	10.5	10.5	11.8	12.5	13.8	13.3	12.9	35	38	36	41	43	3.5	2.9	2.7	2.9	4.5
Delaware	12.1	11.8	12.0	13.9	13.0	16.5	16.3	16.7	16.6	15.3	51	41	51	66	65	5.0	4.7	5.7	4.4	7.1
District of Columbia	13.0	12.7	12.6	14.2	15.2	22.8	21.5	20.6	20.0	19.7	47	47	48	61	72	2.8	4.7	5.4	5.3	6.0
Florida	11.9	11.4	11.6	12.6	12.8	17.2	17.0	16.9	17.7	17.1	54	57	58	60	59	6.3	6.4	7.3	6.8	8.1
Georgia	10.0	9.7	10.5	10.9	11.9	20.2	19.9	20.2	20.1	19.6	58	59	68	63	70	5.2	5.5	6.6	7.4	7.9
Idaho	9.3	9.2	9.0	9.6	10.6	22.4	21.9	22.3	21.2	21.9	41	45	45	45	50	3.2	2.5	3.7	3.9	3.2
Illinois	11.2	11.0	10.8	11.2	11.9	15.6	15.0	15.5	14.8	14.4	25	38	41	43	47	2.9	3.0	3.3	3.8	4.2
Indiana	11.3	11.1	10.9	11.6	12.1	16.9	15.6	16.2	15.0	14.6	39	41	45	52	53	2.7	3.9	3.8	3.7	4.7
Iowa	9.8	9.9	9.6	9.9	10.0	17.9	17.0	17.1	16.7	16.9	34	39	38	41	42	3.1	2.6	3.1	4.0	4.2
Kansas	10.2	10.3	10.2	10.5	11.8	15.9	16.0	16.3	16.0	16.6	33	39	43	45	51	3.6	3.4	4.0	4.1	5.1
Kentucky	10.3	10.4	9.8	10.8	11.2	21.7	20.8	24.6	22.1	19.3	46	54	49	50	67	3.8	4.4	3.8	3.8	5.6
Louisiana	10.9	10.4	10.6	10.9	11.3	21.0	20.5	20.6	19.5	18.2	65	61	66	64	74	5.3	6.0	6.0	7.5	9.4
Maine	12.4	12.8	12.3	13.6	13.7	17.5	17.6	18.2	18.6	18.5	54	51	49	61	64	4.2	4.2	4.2	5.4	5.1
Maryland	12.1	11.5	11.7	12.5	12.6	16.7	15.7	16.4	15.6	15.3	49	50	55	62	68	2.7	3.3	3.4	4.1	4.3
Massachusetts	11.8	11.6	11.2	11.6	11.8	(1)	14.7	13.8	13.9	13.9	(1)	39	40	44	47	(1)	3.5	3.9	4.6	4.9
Michigan	9.9	10.1	10.0	10.8	11.3	18.8	18.3	19.1	18.5	18.3	41	42	45	48	59	2.9	2.9	3.5	3.6	4.7
Minnesota	9.5	9.5	9.4	9.7	10.4	18.5	17.6	17.1	17.1	16.5	33	36	40	41	46	2.3	2.5	2.8	3.1	4.4
Mississippi	10.0	10.0	10.6	11.3	10.5	(1)	23.8	23.5	25.8	24.6	(1)	56	57	59	58	(1)	5.9	5.9	7.1	6.9
Missouri	(1)	11.5	11.4	12.2	13.1	(1)	17.2	16.8	15.3	15.0	(1)	43	49	58	58	(1)	3.4	3.6	5.2	6.1
Montana	10.2	10.6	10.2	10.9	11.3	20.4	19.4	19.2	18.5	18.8	46	50	43	49	53	3.5	3.2	3.7	3.4	5.5
Nebraska	9.5	9.1	9.0	9.8	10.1	16.5	15.5	16.5	16.3	17.3	35	34	36	42	44	3.2	3.4	3.4	3.9	5.6
Nevada	11.9	11.3	11.7	12.2	14.0	18.6	17.3	17.2	15.2	13.8	50	44	45	44	70	4.9	4.2	1.6	6.9	5.6
New Jersey	10.8	10.5	10.5	10.7	10.9	14.1	13.6	13.6	13.2	13.0	36	38	39	39	38	2.8	2.9	3.5	3.4	3.8
New Mexico	10.5	10.9	11.0	12.8	12.7	29.8	30.0	29.0	27.6	26.3	93	96	99	124	122	4.4	4.3	4.6	5.0	7.4
New York	11.1	11.1	11.0	11.6	11.6	14.6	14.1	14.2	14.0	13.7	37	39	40	45	47	2.9	3.0	3.8	3.9	4.9
North Carolina	9.0	9.0	9.7	9.9	10.5	23.0	22.7	23.0	23.3	22.5	56	58	68	65	67	5.3	4.8	5.6	5.4	6.5
North Dakota	7.9	8.4	7.9	8.6	8.6	20.9	20.8	20.2	20.0	20.7	41	48	48	53	50	1.6	2.3	2.2	4.8	4.3
Ohio	11.3	11.2	10.9	11.7	11.9	16.3	15.6	16.4	15.6	15.1	39	45	42	50	51	3.3	3.6	3.7	4.6	4.9
Oklahoma	8.7	8.9	8.5	9.2	9.9	19.0	18.8	19.2	17.6	17.7	50	52	43	59	60	3.5	4.2	4.0	6.9	6.2
Oregon	(1)	10.9	11.0	11.7	11.9	(1)	15.3	15.3	14.7	13.5	(1)	35	38	42	44	(1)	2.4	3.1	3.5	5.4
Pennsylvania	10.9	10.7	10.8	11.5	11.4	16.3	16.3	16.8	16.4	16.2	44	44	46	50	50	2.5	3.2	3.5	4.0	4.6
Rhode Island	11.2	11.0	11.8	12.0	12.2	15.1	14.7	15.0	14.7	14.8	33	40	44	50	49	2.4	3.2	2.5	3.4	4.1
South Carolina	10.6	10.0	10.9	10.8	11.4	22.7	21.7	21.3	20.5	21.2	70	68	81	81	80	6.3	5.9	7.7	7.8	7.9
South Dakota	8.7	8.9	7.4	9.3	9.2	19.0	18.0	18.0	17.6	19.2	39	41	45	52	48	3.7	3.0	3.5	4.2	4.1
Tennessee	10.0	9.7	10.0	10.5	11.4	18.2	17.6	17.9	18.0	17.4	55	54	64	60	68	4.8	5.5	5.6	6.2	7.0

See footnote at end of table.

TABLE 4.—*Trend of death rates from all causes, of birth rates, and of infant and maternal mortality rates, 1936–40*—Continued

[Rates provisional for all years]

State	Deaths, all causes (rate per 1,000 population)					Births, exclusive of stillbirths (rate per 1,000 population)					Infant mortality (rate per 1,000 live births)					Maternal mortality (rate per 1,000 live births)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Texas	9.3	8.7	9.6	10.5	10.6	(1)	17.9	19.2	18.6	18.0	(1)	62	65	74	71	(1)	4.7	5.6	5.7	6.9
Utah	8.9	8.5	8.8	9.1	9.6	24.4	23.1	24.3	23.1	23.5	40	37	45	41	53	2.4	2.8	3.2	3.3	4.4
Vermont	11.6	11.7	11.6	12.2	13.8	18.4	15.9	15.7	17.6	17.9	36	36	43	45	58	3.8	3.3	3.0	4.9	5.0
Virginia	11.0	10.7	10.9	11.1	11.7	20.1	19.4	19.8	19.4	19.7	60	62	69	64	67	4.4	4.9	5.1	5.0	5.1
Washington	11.4	10.8	10.8	11.3	11.5	16.1	14.9	15.4	14.6	13.7	35	38	39	39	46	3.2	3.8	3.6	4.8	5.2
West Virginia	9.2	9.3	9.5	10.4	10.8	22.1	22.0	22.7	22.7	22.2	54	55	62	62	71	3.6	3.5	3.6	4.9	5.3
Wisconsin	10.0	9.9	9.8	10.4	10.8	17.3	17.2	17.4	17.0	16.8	37	40	42	44	47	2.6	2.8	2.9	3.5	4.0
Wyoming	8.5	8.9	9.0	10.2	9.9	19.9	19.7	19.5	18.9	19.7	47	45	53	53	58	4.4	3.5	3.5	3.5	5.0
Alaska	17.4	16.5	17.8	16.6	(1)	23.7	21.2	25.9	19.1	(1)	132	121	78	131	(1)	2.3	3.3	.5	4.5	(1)
Hawaii	7.3	7.5	7.9	8.8	8.7	22.6	21.7	22.1	22.4	21.8	44	54	59	69	73	2.2	3.5	3.8	4.7	4.5

[1] Data not available.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*

[Rates provisional for all years]

State	Typhoid and paratyphoid fever (1, 2)					Cerebral (meningococcus) meningitis (6)					Scarlet fever (8)					Whooping cough (9)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	1.6	1.7	2.1	2.0	2.8	0.8	0.8	2.2	4.1	0.9	0.5	0.5	0.6	0.4	0.5	4.2	5.9	6.0	6.8	2.7
California	(1)	.7	.9	.9	1.1	(1)	.4	.7	1.6	2.0	(1)	.4	.4	.7	1.5	(1)	.7	2.1	4.2	2.0
Colorado	.6	1.9	2.1	2.9	3.1	.4	.7	.5	3.0	2.8	.5	1.0	1.1	2.0	7.1	2.9	4.6	4.2	4.6	4.1
Connecticut	.3	.4	.4	.4	.5	.4	.2	.2	.8	.7	(2)	.2	.2	.7	.7	.2	1.3	.7	1.4	1.9
Delaware	.7	2.6	1.5	2.3	2.7	.7	1.5	.4	1.5	1.2	1.1	.4	.8	.4	2.0	2.2	3.0	5.4	6.6	5.1
District of Columbia	.7	.8	1.0	2.0	1.7	.7	.6	1.4	4.9	10.9	.3	.2	.5	.8	.3	1.6	2.3	1.0	2.8	6.7
Florida	1.3	1.5	2.5	2.9	2.5	.4	.5	.8	4.0	3.7	.1	.3	.2	.1	.1	1.7	3.1	3.6	3.5	1.5
Georgia	2.0	2.6	3.9	4.4	6.3	.3	.5	.6	1.2	2.1	.5	.5	.4	.4	.5	3.3	4.0	7.3	4.6	2.0
Idaho	1.1	3.1	2.9	1.8	2.4	.9	1.7	1.8	1.0	5.9	1.3	.4	1.0	1.8	10.1	1.3	1.9	2.7	3.2	1.6
Illinois	.4	1.4	.8	.7	.9	.2	.2	.3	1.2	2.3	.8	.9	1.7	2.0	3.0	.8	2.0	2.2	1.9	1.9
Indiana	.8	1.1	.7	1.1	1.7	.3	.4	.7	1.6	2.1	1.2	1.4	2.0	3.0	3.4	2.2	1.8	1.3	4.7	1.6
Iowa	.4	.6	.8	.9	1.3	.6	.4	.6	1.0	2.0	.7	.9	1.8	3.8	3.1	.9	1.7	2.6	3.4	1.4
Kansas	.6	.7	.7	.9	1.7	.6	.4	.3	1.4	1.1	.5	.7	1.4	3.6	4.2	1.8	.4	2.8	2.5	.9

Kentucky	2.5	4.3	4.9	5.7	7.4	1.2	1.2	2.2	3.1	6.2	1.0	1.1	1.5	1.8	1.6	6.1	2.4	6.6	8.6	2.6
Louisiana	3.7	5.8	5.0	5.9	6.6	6	6	9	1.2	1.7	[3]	2	.3	6	.2	6.4	4.8	3.9	1.4	4.4
Maine	.6	1.1	1.9	1.7	8	1.1	.4	.1	1.1	1.0	7	.4	[2]	5	8	2.5	3.6	3.0	3.1	2.8
Maryland	.6	.9	1.8	1.8	1.6	3	.6	7	2.5	6.8	4	.3	.5	8	.7	3.5	1.1	2.9	5.5	4.9
Massachusetts	.2	.3	.3	.3	3	3	4	6	1.5	2.3	3	3	.6	9	1.0	5	1.0	.8	2.2	1.2
Michigan	.2	.6	.6	6	.7	.2	.3	.4	8	1.2	8	1.3	1.7	3.0	2.4	1.2	1.5	2.3	2.7	2.2
Minnesota	.2	.1	.3	.3	.5	2	2	4	9	1.8	5	.6	9	1.5	4.0	1.1	6	1.7	2.7	1.2
Mississippi	1.4	2.0	3.0	3.6	4.3	6	1.1	.5	1.2	1.1	1	-----	3	1	2	5.9	6.8	7.0	5.3	2.3
Missouri	[1]	2.6	3.0	4.5	5.6	[1]	.5	5	1.3	2.1	[1]	8	2.0	2.8	2.4	[1]	1.8	4.6	5.0	1.8
Montana	.7	2.2	9	2.0	1.8	1.2	9	1.8	1.3	4.2	1.6	1.6	1.8	2.0	8.3	.9	2.9	8.6	2.5	3.0
Nebraska	.4	.4	5	1.1	9	3	2	4	1.1	1.4	9	1.0	1.1	2.6	4.9	.8	1.0	2.6	2.1	1.7
Nevada	.9	.9	2.8	[2]	1.9	.9	.9	[2]	1.0	3.9	[2]	[2]	[2]	1.9	7.8	2.7	[2]	2.8	1.9	3.9
New Jersey	.3	.4	4	7	.7	1	5	5	1.1	1.8	4	.5	3	.4	8	.6	1.1	1.3	1.2	1.4
New Mexico	3.0	3.2	4.1	5.6	7.3	6	1.0	.8	1.0	2.9	.6	4	1.0	1.4	4.1	9.5	7.1	12.3	9.6	6.5
New York	.3	3	5	.5	6	.4	5	8	1.2	2.2	.3	4	5	7	1.4	1.0	1.0	1.3	1.3	1.1
North Carolina	1.1	1.3	2.0	2.3	2.2	.3	.5	.9	1.2	1.6	3	.1	.6	5	7	2.5	6.4	7.6	4.9	1.1
North Dakota	.6	.6	.3	5	6	.3	5	1.4	2.0	1.1	.8	1.1	2.8	1.8	5.0	2.2	2.0	9.7	1.5	.6
Ohio	.7	.7	.8	1.5	1.7	4	.2	7	1.4	2.1	6	1.1	1.2	1.9	2.3	1.8	1.2	1.8	4.2	2.7
Oklahoma	2.5	3.4	4.1	5.8	5.6	9	.5	1.0	2.1	4.9	3	.7	.9	1.4	1.9	2.4	1.0	7.9	3.6	1.7
Oregon	[1]	1.5	.5	.8	1.6	[1]	.6	1.2	7	1.4	[1]	5	.9	1.0	1.7	[1]	.7	2.0	2.1	1.9
Pennsylvania	6	.6	.9	1.1	1.1	.6	6	7	1.3	1.2	5	8	1.2	1.5	1.6	1.3	1.5	1.7	2.7	1.5
Rhode Island	1.0	.1	.4	.1	4	3	.6	.9	2.2	3.1	[2]	[2]	4	1.6	1.9	3	2.0	1.1	3.0	1.0
South Carolina	4.1	5.1	6.5	6.5	10.2	4	.4	8	1.0	2.6	1	2	.5	3	.7	2.6	6.5	14.3	4.6	3.5
South Dakota	[2]	1.2	1.2	1.1	1.6	6	8	.3	1.1	6	.6	1.2	1.1	3.0	3.7	.6	.9	7.8	3.2	.6
Tennessee	2.1	3.3	3.7	4.9	5.1	6	7	1.7	2.5	3.7	.5	6	7	7	.8	3.9	3.3	7.1	4.8	2.5
Texas	3.1	4.5	6.2	6.3	6.5	.5	3	6	1.5	2.1	2	3	5	8	1.0	3.7	3.3	5.9	5.9	2.2
Utah	.5	4	.4	.7	1.5	.5	9	1.3	1.7	3.4	1.1	.4	9	1.7	8.2	1.8	1.1	2.8	2.6	4.1
Vermont	.8	3	.3	1.1	1.7	1.4	.6	[2]	2.5	1.7	3	1.1	3	3	8	1.7	6.7	3.1	.8	2.8
Virginia	1.0	1.8	2.1	2.0	2.8	1.2	.9	1.6	4.1	5.4	4	3	3	3	5	4.7	5.8	7.1	8.1	4.5
Washington	.7	1.0	8	.7	1.1	.5	.5	6	1.2	1.5	.4	.7	5	1.0	1.5	1.1	2	1.9	1.8	.8
West Virginia	1.9	2.9	3.5	4.5	4.2	1.5	1.9	1.7	4.5	5.6	1.0	1.1	2.0	1.9	2.2	6.2	2.2	7.2	13.2	3.9
Wisconsin	.1	.2	2	.4	.4	2	.2	.3	7	.9	7	1.1	1.2	2.2	4.2	1.1	1.4	1.8	2.0	1.4
Wyoming	.8	2.8	2.0	1.2	.4	2.8	.8	.8	2.5	2.1	4	.4	2.4	3.7	9.1	.4	4	13.4	4.9	1.2
Alaska	[2]	[2]	1.4	1.4	[1]	1.4	[2]	[2]	12.9	[1]	[2]	8.3	1.4	1.4	[1]	21.8	26.3	53.6	31.6	[1]
Hawaii	2.4	1.9	2.4	1.7	2.3	.5	.5	.5	.5	1.8	[2]	[2]	.2	[2]	[2]	1.9	7.2	5.4	2.5	.5

[1] Data not available.
[2] No deaths reported.
[3] Less than 1/16 of 1 per 100,000 population.

Table 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

	Diphtheria (10)					Tuberculosis, all forms (13–22)					Malaria (28)*					Influenza (grippe) (33)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	2.1	2.9	3.8	3.5	4.2	52.1	55.2	57.4	63.0	66.2	7.0	7.2	7.9	8.2	12.7	32.7	34.4	26.7	52.0	50.2
California	(1)	.9	1.5	1.6	2.0	(1)	57.3	61.1	67.5	71.6	(1)	-----	.1	.2	.1	(1)	3.5	3.9	19.4	11.1
Colorado	1.2	2.9	3.3	.31	3.4	52.9	55.5	57.6	64.3	76.2	-----	-----	-----	-----	-----	13.7	22.8	13.4	48.0	32.5
Connecticut	.2	.4	.7	1.4	.5	32.4	34.3	36.8	37.9	40.0	-----	-----	-----	-----	-----	4.4	4.7	4.5	12.2	8.3
Delaware	(2)	.8	.8	4	1.2	46.8	57.1	50.1	56.1	50.0	-----	-----	-----	-----	-----	10.5	12.9	10.7	22.8	10.9
District of Columbia	.4	.8	1.1	2.3	4.7	64.0	66.1	71.7	90.4	110.5	.1	.2	-----	-----	-----	6.9	9.2	5.2	16.0	7.9
Florida	1.4	1.9	1.9	3.2	3.5	50.0	49.4	54.5	57.5	54.6	5.2	6.1	8.9	12.2	21.0	28.8	27.7	20.7	39.5	53.5
Georgia	1.8	2.9	3.3	3.4	3.8	47.2	46.4	50.4	49.7	55.4	2.8	3.1	4.9	7.0	20.0	28.7	29.1	24.9	44.9	59.2
Idaho	.2	.8	.6	1.2	.6	17.8	18.7	19.4	20.3	24.0	8	2	-----	-----	-----	17.8	17.5	16.3	38.8	18.6
Illinois	1.1	1.5	1.5	2.0	2.2	46.2	45.8	47.0	51.1	52.0	.2	.4	.4	.5	.7	8.1	12.3	5.6	17.1	14.6
Indiana	1.0	1.6	2.4	1.6	2.9	37.6	41.4	39.4	46.8	48.4	.3	2	.3	.6	.1	21.9	26.0	12.7	33.3	29.0
Iowa	.5	.6	1.0	.4	1.0	16.0	17.4	18.3	20.5	22.4	-----	(3)	(3)	.1	.1	15.9	23.7	12.6	32.7	20.1
Kansas	.7	.4	1.0	1.3	2.3	24.7	23.5	23.6	27.2	29.9	3	1	.2	.2	3	18.4	18.9	15.8	34.8	48.7
Kentucky	1.8	3.2	4.0	4.9	5.1	66.4	70.3	69.7	72.4	71.6	.6	1.1	1.1	1.4	1.8	28.2	33.8	25.5	50.7	43.3
Louisiana	2.1	2.9	3.2	3.1	4.0	58.8	58.8	61.7	66.2	68.0	3.7	5.0	7.9	7.9	11.7	32.7	23.1	23.2	49.9	46.3
Maine	.7	2.1	2.0	.6	.8	29.5	35.1	30.2	32.4	40.9	.1	-----	-----	-----	-----	12.6	20.2	15.3	38.6	25.6
Maryland	.4	1.1	1.0	1.2	1.5	78.6	72.1	74.4	79.3	79.2	-----	-----	2	.1	.1	8.4	9.7	7.4	16.5	11.2
Massachusetts	.2	.3	.4	.4	.6	37.4	37.1	38.1	42.1	43.7	-----	(3)	(3)	(3)	-----	3.4	5.4	3.6	9.7	6.4
Michigan	.4	.5	.9	1.4	1.1	33.3	36.5	37.0	42.9	43.5	-----	(3)	-----	.1	.1	5.1	14.5	6.3	17.3	11.9
Minnesota	.2	.4	5	5	.6	26.4	28.8	28.3	33.0	34.7	-----	-----	-----	-----	(3)	8.4	11.7	8.8	23.2	13.9
Mississippi	2.4	2.5	3.7	2.4	3.3	44.5	48.5	54.1	61.0	53.5	7.2	9.6	12.5	14.1	15.6	36.6	37.5	31.0	57.1	62.6
Missouri	(1)	2.0	3.3	2.5	2.1	(1)	47.4	51.4	58.2	61.9	(1)	1.8	2.1	2.5	2.8	(1)	20.0	15.1	36.7	41.1
Montana	1.1	1.6	1.6	1.4	2.0	40.2	42.7	42.5	42.5	39.7	-----	-----	-----	-----	.2	13.7	23.3	19.1	54.1	23.4
Nebraska	.8	1.0	1.2	1.1	1.6	17.0	16.5	16.4	19.5	18.4	-----	-----	-----	-----	-----	19.9	17.1	11.3	42.2	21.7
Nevada	.9	(2)	2.8	(2)	1.0	67.7	52.4	58.1	82.1	85.4	-----	-----	-----	-----	-----	11.7	6.4	.9	8.6	25.2
New Jersey	.6	.6	8	7	.5	42.8	43.2	46.2	48.8	52.8	-----	(3)	-----	-----	(3)	4.2	5.8	4.8	10.5	8.3
New Mexico	1.3	2.9	3.3	3.6	3.3	70.7	72.6	76.7	106.3	104.9	.7	8	.2	-----	.4	13.7	19.9	10.7	32.7	29.9
New York	.1	.2	.3	6	.5	46.2	47.9	48.8	56.0	57.4	1	.2	.3	2	.1	3.1	4.1	3.5	9.9	6.4
North Carolina	3.3	4.9	5.1	4.8	5.6	49.7	51.0	53.6	54.6	61.3	1.8	1.7	2.2	2.7	4.4	21.1	17.9	14.2	25.4	32.6
North Dakota	1.4	2.0	.9	1.7	1.7	20.0	21.9	21.6	28.1	26.7	-----	-----	-----	-----	-----	9.2	17.5	11.7	29.8	13.6
Ohio	.4	.9	1.3	1.6	1.5	39.9	42.6	45.1	48.7	52.1	1	(3)	(3)	-----	1	14.7	18.7	11.1	29.7	19.7
Oklahoma	3.2	3.3	5.2	4.1	3.8	47.6	45.7	48.9	52.4	54.8	1.0	2.2	3.5	3.6	4.0	24.4	21.9	17.2	43.5	49.4
Oregon	(1)	.2	.9	.8	.9	(1)	29.2	28.2	33.1	35.7	(1)	1	-----	.1	1	(1)	9.2	8.5	28.1	19.3
Pennsylvania	.4	.7	1.0	1.0	1.3	39.5	40.2	42.2	47.0	46.0	-----	(3)	(3)	.1	.1	10.8	12.3	10.1	27.6	16.6
Rhode Island	.3	.1	.1	4	1	33.0	37.5	39.6	46.1	47.6	-----	-----	-----	-----	-----	4.3	5.1	4.7	10.8	9.1
South Carolina	2.9	4.3	2.8	3.6	4.0	46.9	44.2	48.9	51.0	53.8	6.8	9.0	11.9	14.1	23.6	33.7	29.6	28.7	43.0	50.3
South Dakota	.8	3.2	1.5	.8	7	34.3	29.2	36.4	39.0	35.7	-----	-----	-----	-----	-----	15.4	21.1	14.7	40.5	21.0
Tennessee	1.6	3.0	3.7	4.8	5.5	72.8	78.5	76.2	84.8	89.4	2.2	3.4	3.6	3.6	5.6	31.0	31.8	26.0	47.9	55.6

Texas	2.3	2.6	3.8	3.9	5.6	56.4	57.0	65.5	68.7	70.6	2.4	2.2	4.0	5.8	8.0	26.4	20.7	24.3	52.3	52.6
Utah	(2)	.9	1.1	1.1	9	15.8	16.3	18.3	19.7	20.8	......	......	......	......	......	19.8	12.8	9.4	23.2	20.8
Vermont	(2)	.8	3.6	6	(2)	36.5	39.0	37.1	50.4	45.1	......	......	......	......	......	12.8	25.9	14.2	32.1	32.8
Virginia	2.0	3.7	4.4	3.2	4.0	58.5	60.0	66.5	62.8	68.9	2	3	.1	.3	.7	25.1	22.2	19.1	40.3	39.3
Washington	.6	.7	6	9	.4	40.8	41.6	41.9	45.5	48.9	......	......	......	......	......	17.2	8.5	10.2	23.8	25.6
West Virginia	2.0	3.2	3.6	4.9	7.1	45.5	46.4	49.8	52.9	54.2	1	......	.1	.1	.1	18.6	19.6	19.0	42.5	33.7
Wisconsin	2	.1	.5	8	.5	26.0	27.3	29.5	33.1	34.4	(3)	......	......	......	.1	11.4	17.3	7.6	37.5	15.1
Wyoming	1.6	1.2	2.8	(2)	3.7	15.9	22.9	23.2	18.1	17.4	......	......	......	......	......	10.7	11.3	12.6	44.4	23.2
Hawaii	1.4	1.0	.5	2.7	1.8	61.2	66.9	65.1	79.1	86.1	......	......	......	......	......	8.5	3.8	5.4	9.2	13.1
Alaska	4.1	1.4	2.8	(2)	(1)	365.9	361.5	409.2	365.2	(1)	......	......	......	......	(1)	10.9	22.2	36.7	34.5	(1)

* Leaders indicate no deaths reported.
[1] Data not available
[2] No deaths reported.
[3] Less than 1/10 of 1 per 100,000 population.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

State	Measles (35)					Acute poliomyelitis and polioencephalitis (36)					Acute infectious encephalitis, (lethargic) (37)					Cancer and malignant tumors (45–55)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	1.2	2.1	6.0	0.1	0.7	0.7	0.5	0.6	0.7	1.4	0.6	0.4	0.6	0.4	0.4	64.4	60.3	59.4	59.6	61.4
California	(1)	.9	.9	.5	2.3	(1)	1.1	.2	1.2	.6	(1)	.4	.6	.8	.5	(1)	141.7	137.9	132.2	136.2
Colorado	1.3	1.3	2.7	.5	.7	1.2	1.1	.6	4.4	1.4	.7	.5	1.5	1.0	1.0	118.8	112.6	113.2	111.2	116.7
Connecticut	.2	.5	.1	.7	.4	.1	.1	(2)	.5	.1	.2	.1	.1	.4	.2	136.0	138.6	143.1	130.5	129.8
Delaware	(2)	(2)	.8	1.5	3.1	.7	.4	.4	.4	.4	(2)	1.1	(2)	.4	.4	138.4	109.4	117.5	120.0	123.4
District of Columbia	(2)	.3	.3	2.1	1.3	.4	.2	.5	.7	.3	.7	.2	.5	.8	.7	151.3	156.4	137.6	142.1	141.7
Florida	.3	.7	1.5	.3	.4	.4	.3	.6	.3	.4	.3	.4	.5	(2)	.5	93.9	92.6	84.3	97.3	88.4
Georgia	.7	1.6	4.8	.3	.2	.2	.5	.6	.6	.9	.1	.1	.3	.2	.3	60.7	61.3	60.6	57.6	56.4
Idaho	.9	.8	.8	2.8	2.2	.6	1.5	.2	.4	1.0	.9	1.5	1.2	.8	1.2	88.6	89.1	83.1	81.9	78.0
Illinois	.2	(3)	2.6	.3	.1	.7	.3	.2	1.2	1.0	.3	.2	.4	.5	.4	143.0	141.9	137.1	132.3	131.9
Indiana	.1	.2	3.1	.4	.1	2.1	.1	.3	.8	.4	.6	.5	.7	.5	.6	122.3	112.1	113.8	110.0	111.3
Iowa	.5	1.1	1.0	.2	.1	2.2	1.1	.4	1.5	.5	.8	.7	1.0	.6	.5	130.1	124.5	128.5	126.1	122.2
Kansas	.9	.2	1.3	.2	.2	2.2	.3	(2)	1.9	.6	.8	1.6	1.2	1.3	1.1	122.3	124.4	123.9	118.6	120.5
Kentucky	.6	1.1	3.8	3.0	2.7	1.4	1.2	1.0	1.1	1.2	.5	.8	.3	.7	.8	82.9	81.2	73.8	71.6	74.6
Louisiana	.5	4.1	.9	.7	2.2	.8	.4	.4	.9	.5	.2	.3	.4	.3	.2	87.5	76.7	80.9	76.3	75.6
Maine	1.1	.6	2.1	.4	2.5	.2	.7	.5	1.8	.4	.4	.6	.1	.2	.2	151.5	151.7	151.1	147.4	155.8
Maryland	.1	.9	.4	2.2	1.5	.3	.1	.1	1.0	.1	.4	.4	.9	1.4	1.0	138.1	131.8	128.6	127.8	123.1
Massachusetts	.3	.4	.3	.6	.8	(3)	.1	.2	.5	.2	.2	.2	.2	.3	.3	171.2	160.4	160.4	151.0	152.0
Michigan	.3	.6	2.0	.2	.2	1.3	.8	.2	1.9	.5	.3	.1	.2	.2	.4	117.8	116.7	114.2	111.8	114.7
Minnesota	.2	2.3	.9	.3	.8	.9	1.9	.3	1.9	.2	.5	.3	.7	.9	.6	133.4	134.2	135.8	136.8	130.0
Mississippi	.3	3.6	3.6	2.8	1.2	.6	.6	1.0	2.8	1.1	.5	.3	.4	.6	.3	62.6	61.8	64.9	62.6	56.1
Missouri	(1)	.3	5.2	.5	.4	(1)	.5	.4	2.0	.6	(1)	.4	.6	4.0	.9	(1)	133.5	132.2	125.8	125.4
Montana	.9	2.9	2.0	.7	.5	1.4	(2)	.4	1.3	.5	1.8	1.4	5.4	.9	.4	110.7	114.8	98.2	104.6	102.1
Nebraska	.5	1.0	.8	.3	.7	1.6	.6	.5	3.3	.7	.5	.4	.8	.9	.4	124.8	117.9	122.2	115.0	115.1
Nevada	(2)	1.8	(2)	(2)	(2)	.9	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	1.0	114.7	112.2	102.1	67.7	92.1
New Jersey	.2	.1	.7	1.3	.4	.1	.7	.2	.5	.2	.6	.5	.7	.6	.9	146.2	140.3	134.3	131.5	134.0
New Mexico	.9	.8	10.0	8.6	2.4	.6	1.5	.8	1.4	1.4	(2)	.4	(2)	(2)	.6	58.4	52.9	52.7	48.1	47.8
New York	.1	.4	.7	.4	1.0	.1	.4	.2	.4	.1	.9	.4	.7	.6	.5	158.0	154.4	151.6	147.6	144.9
North Carolina	.3	1.8	7.0	1.2	.3	.3	.3	.3	.6	.4	.3	.2	.4	.4	.4	57.5	56.2	54.5	54.7	52.3
North Dakota	.3	3.4	2.9	(2)	.5	.6	.3	(2)	(2)	.5	2.0	1.7	4.2	.6	.8	95.8	98.1	94.8	87.5	89.4
Ohio	(3)	.1	2.6	1.5	.6	.8	.2	.2	.8	.8	.5	.6	.4	1.0	.9	135.1	132.1	127.5	119.6	124.6
Oklahoma	.2	3.2	2.4	1.0	.6	1.2	.4	1.0	2.5	1.5	.6	.6	.3	.3	.8	82.6	78.6	75.3	77.9	72.4
Oregon	(1)	.7	.6	.1	4.0	(1)	.4	.8	.7	.9	(1)	.7	1.1	1.1	1.8	(1)	123.4	133.4	118.8	132.3
Pennsylvania	.1	.1	2.4	.8	.3	.3	.5	.2	.5	.2	.6	.6	.7	.7	.6	123.6	123.3	121.0	119.2	115.8
Rhode Island	.4	.4	(2)	.4	.7	.3	(2)	.1	(2)	(2)	.3	(2)	.6	.3	.3	157.4	151.1	154.9	153.7	144.5
South Carolina	.7	.5	7.6	.9	.5	.5	2.2	.5	.7	.9	.3	.2	.4	.3	.2	55.8	54.4	54.3	51.0	50.0
South Dakota	.5	4.3	.8	(2)	.3	.8	.6	.3	1.2	.1	.2	.5	1.1	1.2	.3	105.3	104.3	91.1	87.9	91.7
Tennessee	.6	1.5	6.9	1.1	.8	.3	.5	.7	1.2	1.6	.6	.7	.5	.8	.9	73.5	70.9	73.0	68.9	67.2
Texas	3.1	1.3	1.8	3.5	2.7	.6	1.1	.7	2.0	.6	.4	.3	(2)	(2)	.4	75.5	67.6	72.9	72.0	72.7

Utah	.9	.4	2.0	.7	1 1	1.1	1 3	(2)	1 3	.2	.4	9	.2	.9	.6	90.5	91 8	84.8	88.1	78.4
Vermont	(2)	1 7	3 3	(2)	6 1	3	1 4	1 1	.6	(2)	.3	.3	.3	(2)	.6	137.2	140.4	132.9	146.9	145.5
Virginia	.8	8	3.4	2 5	1 1	1 0	.3	.3	.5	.5	7	.3	2	.6	.4	81.3	80.3	80.5	73.7	73.6
Washington	1.0	.9	.2	8	2 0	2,0	.4	.2	5	1.0	2.2	1 5	1.3	1.8	2.4	143.3	138.7	132.7	129.8	131.0
West Virginia	(2)	.3	6 2	2 2	1.6	3 2	.5	8	1 1	1.2	.3	.6	5	2	.5	76.2	74.9	74.6	74.1	70.4
Wisconsin	.3	.6	1 2	.2	.4	1 4	4	1 2	1 2	1	.8	.3	.3	.5	.7	132.9	127 3	130.2	126.7	126.1
Wyoming	2 4	.4	(2)	.4	(2)	2.8	1.2	1.2	2.9	.4	1.6	(2)	.8	1.6	.8	84.7	75.1	83.3	73.9	71.3
Alaska	159 1	54 0	1.4	4 3	(1)	(2)	(2)	1.4	2.9	(1)	(2)	1.4	(3)	1.4	(1)	74.8	70.0	66.3	61 8	(1)
Hawaii	(2)	(2)	.2	46.7	6 8	1 2	1 4	.5	.5	.3	(2)	.2	5	.2	.8	67.3	71.2	67.1	74.4	69.4

[1] Data not available.
[2] No deaths reported.
[3] Less than 1/10 of 1 per 100,000 inhabitants.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

State	Diabetes mellitus (61)					Pellagra (except alcoholic) (69)*					Cerebral hemorrhage, embolism and thrombosis (83a, b)					Diseases of the heart (90–95)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	12.1	12.2	12.5	10.8	12.8	8.5	10.0	12.4	11.2	11.1	77.9	70.1	71.9	69.9	71.7	178.7	170.6	173.4	168.8	152.8
California	(1)	24.0	23.3	24.0	22.6	(1)	.6	1.0	1.1	1.3	(1)	85.0	83.3	79.8	80.0	(1)	339.1	329.8	340.8	313.6
Colorado	18.2	18.2	17.1	15.1	18.4	1	.1	.1	2	5	86.3	86.6	85.8	83.6	84.5	249.6	254.5	236.2	204.9	250.0
Connecticut	22.8	29.2	30.1	31.7	29.3	.2	.1	.1	3	3	99.1	82.1	88.1	88.5	83.3	239.4	295.1	254.7	243.3	247.3
Delaware	31.8	33.7	31.7	30.2	29.7	------	------	4	------	------	105.5	117.4	93.0	115.0	115.2	355.1	363.3	365.9	367.3	350.4
District of Columbia	32.2	23.8	26.0	29.3	27.6	1	2	6	8	5	92.9	83.8	83.8	97.3	104.3	347.2	344.1	341.7	331.2	350.9
Florida	19.5	20.6	18.2	17.7	18.6	3.8	4.0	5.7	6.2	8.1	111.6	95.5	95.0	113.7	112.5	284.5	243.6	241.9	241.3	238.4
Georgia	10.9	11.4	13.1	12.2	12.6	7.3	8.5	11.6	11.8	12.6	91.4	93.1	85.2	83.8	83.1	190.8	167.0	165.8	168.6	181.1
Idaho	17.8	20.0	13.7	12.3	13.3	6	.4	------	------	2	61.7	60.9	61.3	63.7	72.1	242.9	241.8	203.2	148.0	182.6
Illinois	33.3	30.0	27.7	27.3	29.4	.2	.3	.2	2	2	81.9	75.1	73.6	72.2	79.6	349.6	338.6	316.3	304.1	319.5
Indiana	14.7	16.6	16.1	15.1	15.9	.1	.1	.1	.5	5	141.0	132.2	123.2	123.4	131.3	304.4	249.6	238.2	251.4	273.5
Iowa	26.5	24.5	22.0	21.7	24.5	------	.2	(3)	.2	(3)	106.1	103.1	99.7	104.9	105.4	279.8	268.2	245.6	223.7	234.4
Kansas	26.0	26.7	24.6	23.9	23.5	4	3	3	4	7	101.3	101.1	102.3	100.4	105.6	275.1	259.1	247.1	230.5	248.5
Kentucky	14.3	13.0	13.3	11.1	15.1	1.9	2.8	2.2	2.7	3.1	104.1	106.6	100.1	91.8	83.9	215.9	217.9	188.0	173.6	207.1
Louisiana	18.1	16.3	16.2	16.7	16.3	2.7	3.5	6.3	4.3	5.5	65.0	68.2	64.4	63.5	66.8	251.0	214.9	200.7	197.2	186.3
Maine	31.1	27.3	27.5	24.0	29.0	------	5	2	.1	.1	129.4	126.7	115.6	130.9	129.9	361.1	376.9	343.7	369.7	354.6
Maryland	31.3	29.2	27.1	25.0	26.3	.2	.4	3	.4	5	97.0	96.3	96.5	102.8	105.8	346.7	313.7	308.5	298.2	291.3
Massachusetts	36.5	35.1	33.4	34.1	32.0	.1	2	2	3	.3	105.5	103.4	97.9	97.1	98.4	421.9	407.3	372.6	366.9	352.8
Michigan	26.6	26.2	25.3	25.4	26.2	2	(3)	1	(3)	.1	89.9	82.6	86.4	85.0	93.9	295.2	287.1	273.7	266.6	276.3
Minnesota	25.9	25.9	24.9	23.2	25.1	1	------	.1	.1	.1	91.4	91.8	83.5	84.1	84.2	272.9	253.6	241.3	226.1	237.5
Mississippi	12.8	12.2	12.0	11.4	10.6	6.8	8.8	12.4	11.1	11.8	71.4	71.6	63.1	67.5	65.2	152.0	153.6	147.2	137.8	124.1
Missouri	(1)	25.0	23.1	22.8	24.0	(1)	.8	.6	5	1.0	(1)	93.5	90.7	96.7	96.9	(1)	278.3	270.0	271.4	276.5
Montana	11.6	17.2	17.7	19.7	21.6	------	2	------	.2	2	96.4	84.7	92.1	83.6	88.7	237.6	231.9	208.5	215.4	186.6
Nebraska	28.8	25.0	25.4	26.7	25.2	1	------	1	.2	.1	114.0	91.4	85.4	90.5	91.1	234.4	210.2	223.3	225.4	224.7
Nevada	20.8	9.2	12.2	13.4	12.6	.9	.9	------	1.0	------	65.9	67.2	76.8	71.6	66.9	309.7	264.0	266.9	246.2	281.3
New Jersey	36.4	33.6	30.7	31.9	32.2	3	1	2	.2	2	90.3	86.6	84.6	80.4	85.0	358.9	356.7	339.3	325.4	317.4
New Mexico	9.4	8.6	7.2	6.8	7.5	3.6	2.9	3.5	3.6	4.3	40.2	38.8	43.0	43.3	39.1	116.2	108.5	113.4	121.9	116.7
New York	40.5	39.1	35.5	36.3	35.7	.1	2	2	.2	.2	72.2	66.9	63.3	73.1	77.5	384.4	366.6	355.7	353.9	344.2
North Carolina	13.6	13.8	10.9	11.1	11.7	4.7	5.8	7.3	9.5	10.3	84.7	80.2	81.9	80.1	92.2	152.2	161.5	164.1	161.0	176.9
North Dakota	25.6	21.9	21.0	19.0	20.1	.2	------	------	------	------	69.3	77.7	69.0	73.0	72.3	205.6	206.4	160.4	177.4	172.0
Ohio	31.2	29.2	27.0	26.5	27.3	1	.1	------	(3)	4	111.1	107.9	101.1	106.1	114.8	315.2	298.0	276.6	427.6	276.8
Oklahoma	14.0	14.7	13.8	13.8	15.6	2.2	4.2	4.5	4.3	7.4	80.9	85.9	68.0	67.5	68.5	162.4	152.1	140.1	140.5	146.8
Oregon	(1)	25.3	23.3	24.5	22.8	(1)	3	------	2	.2	(1)	107.1	99.5	99.7	106.2	(1)	283.3	268.2	267.2	271.6
Pennsylvania	35.4	33.8	31.1	32.0	28.4	.1	.1	1	.1	.1	83.6	83.3	83.1	82.3	89.5	335.0	324.2	313.0	313.2	302.9
Rhode Island	38.7	36.9	40.4	41.5	33.6	(3)	3	3	1	.1	99.8	87.6	94.3	96.8	97.9	372.9	362.8	352.8	362.0	353.2
South Carolina	12.7	13.4	12.1	11.6	11.1	8.5	7.8	12.2	14.6	14.9	104.9	95.7	93.4	94.6	107.4	203.0	185.9	188.7	187.4	179.8
South Dakota	23.9	26.7	19.6	20.6	22.2	.2	------	------	------	.1	82.0	76.1	71.1	72.6	84.9	207.4	201.1	172.4	174.9	159.3
Tennessee	14.0	13.4	11.1	11.5	11.5	3.6	5.1	7.1	7.1	8.7	83.2	80.7	81.2	80.6	82.0	186.8	173.5	162.6	161.5	164.7
Texas	13.6	11.8	11.9	12.5	12.6	5.1	5.7	8.6	9.3	11.5	62.4	60.5	69.3	68.5	61.4	178.9	166.2	119.3	122.3	166.0

Utah	19.6	18.3	19.9	18.4	19.6	.4	.2	-------	.2	-------	58.4	54.1	52.0	58.2	48.3	245.9	233.4	224.3	220.0	210.9
Vermont	27.6	32.6	30.7	20.1	27.0	-------	-------	-------	.3	-------	119.4	115.9	110.9	103.4	121.9	332.1	359.6	301.5	332.2	376.7
Virginia	20.3	17.5	16.6	16.6	16.0	2.1	2.2	4.2	4.0	5.0	104.3	104.1	97.2	92.3	99.0	248.0	245.6	236.8	227.9	239.4
Washington	26.4	25.3	24.2	23.1	24.9	.2	.1	-------	.2	.2	106.6	105.7	105.9	100.5	102.1	344.9	288.5	275.8	296.8	277.3
West Virginia	17.2	17.6	16.2	15.2	14.6	.6	3	3	.6	5	78.5	77.5	72.7	74.5	78.3	172.1	172.1	166.8	167.4	169.9
Wisconsin	28.1	27.0	28.1	25.2	28.2	.1	1	2	.1	.1	96.0	85.9	84.4	86.6	93.1	295.6	298.8	274.9	268.5	276.1
Wyoming	14.3	16.5	13.8	10.7	14.9	-------	4	-------	-------	-------	66.0	57.5	57.3	81.3	71.7	201.3	208.7	206.9	245.2	200.2
Alaska	4.1	4.2	1.4	5.8	-------	-------	-------	-------	-------	-------	76.2	59.6	125.6	61.8	-------	208.1	227.2	242.7	279.0	-------
Hawaii	14.4	16.6	16.8	17.5	18.7	-------	-------	-------	.5	.3	43.7	47.6	54.9	45.4	48.2	128.5	126.3	126.6	119.8	131.8

*Leaders indicate no deaths reported.

[1] Data not available.

[2] Less than 1/10 of 1 per 100,000 inhabitants.

TABLE 5.—*Trends of death rates for various causes per 100,000 population, 1936–40*—Continued

State	Pneumonia, all forms (107–109)					Diseases of the digestive system (115–129)					Diarrhea and enteritis under 2 years (119)					Nephritis, all forms (130–132)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	58.6	68.9	78.9	94.0	101.4	54.9	58.8	69.0	66.8	70.5	12.5	13.9	18.6	16.2	18.1	93.8	69.6	79.8	81.3	82.2
California	(1)	45.0	54.6	76.8	68.0	(1)	73.4	72.0	79.5	79.1	(1)	8.9	7.7	11.7	9.7	(1)	69.0	71.7	77.5	78.4
Colorado	78.1	88.3	101.5	163.3	131.3	76.1	65.0	71.2	81.1	101.7	14.8	12.1	13.8	26.0	23.6	70.8	73.0	83.6	77.6	84.3
Connecticut	38.3	42.3	51.0	69.5	73.0	44.7	48.5	49.7	49.3	51.3	1.9	2.1	3.4	3.1	2.7	55.5	76.4	80.7	80.4	86.0
Delaware	58.4	70.4	68.9	97.1	85.6	52.0	52.6	65.5	72.8	69.1	4.9	5.3	12.2	9.7	15.6	134.3	106.7	105.3	137.4	120.7
District of Columbia	80.1	72.4	86.6	124.0	144.0	83.0	81.3	76.6	81.6	87.3	10.2	11.5	11.4	11.9	15.6	110.0	105.2	102.0	100.4	100.5
Florida	56.1	56.2	68.5	73.4	85.5	68.3	76.8	82.8	98.5	85.4	7.6	10.5	12.1	11.0	9.5	89.3	91.2	90.6	100.3	104.4
Georgia	63.0	68.7	85.0	94.5	121.0	59.4	57.5	69.8	67.8	73.0	12.5	13.0	22.0	15.4	17.5	103.7	91.6	110.2	108.6	108.9
Idaho	41.2	56.7	76.2	75.9	108.3	55.0	56.1	54.5	70.5	63.4	6.5	5.8	4.9	9.0	7.1	57.1	53.2	54.9	62.7	61.9
Illinois	47.3	54.0	58.6	70.5	80.9	59.0	62.0	65.0	69.5	73.1	2.5	3.1	5.5	4.6	6.6	91.6	92.3	92.1	95.2	102.6
Indiana	58.6	68.7	70.6	94.5	99.9	(1)	50.2	56.0	53.7	72.8	3.5	5.5	8.6	8.8	9.1	73.9	64.6	61.9	65.8	76.6
Iowa	48.9	50.3	61.2	65.3	72.0	49.8	53.9	55.5	55.6	57.5	2.1	2.3	3.4	3.9	4.5	64.0	54.4	57.1	59.1	60.6
Kansas	35.9	43.8	51.3	61.1	86.6	55.0	60.2	61.9	61.1	74.2	3.8	4.0	5.1	6.2	7.0	95.7	97.1	95.7	89.5	99.8
Kentucky	62.3	73.1	76.3	93.8	104.4	57.8	66.8	77.3	75.6	81.0	13.7	19.0	30.4	23.4	30.0	73.9	65.8	72.1	69.4	76.2
Louisiana	76.7	80.2	90.8	98.5	112.4	63.9	66.6	71.2	69.7	73.6	14.9	12.4	16.3	15.3	16.3	86.8	90.7	93.4	97.2	100.9
Maine	54.8	74.1	75.7	96.1	99.2	53.4	55.5	59.1	60.7	68.2	5.3	5.6	7.8	14.4	6.2	88.3	81.4	83.8	83.6	89.7
Maryland	61.9	67.5	75.4	103.4	106.2	50.9	53.9	58.5	65.6	67.2	6.7	9.4	11.3	13.1	15.4	127.5	118.9	124.6	131.8	136.2
Massachusetts	61.1	71.3	73.5	94.5	97.2	53.9	55.7	56.2	60.5	60.6	3.0	2.0	2.7	2.8	3.5	70.4	67.2	68.8	70.4	73.4
Michigan	46.8	54.1	56.7	83.0	84.6	52.8	57.7	60.0	61.1	74.5	3.3	5.2	6.2	5.7	9.7	53.9	51.2	54.7	59.3	62.9
Minnesota	55.9	56.6	[illegible]	72.8	82.8	50.4	54.4	52.7	54.5	61.5	2.5	3.3	3.3	2.8	4.5	37.3	30.4	41.4	44.2	46.8
Mississippi	45.2	56.0	66.1	86.7	75.8	57.3	58.1	62.3	71.9	68.0	13.5	13.1	16.0	19.5	17.7	99.1	89.2	96.7	98.5	91.0
Missouri	(1)	77.6	88.5	117.6	124.0	(1)	67.3	63.1	65.4	89.9	(1)	9.0	11.4	11.6	16.0	(1)	112.5	108.0	106.0	122.8
Montana	58.7	66.2	74.6	101.5	117.0	69.8	67.8	65.9	71.7	85.3	7.0	5.2	5.8	6.9	11.1	57.0	57.9	56.6	56.6	71.1
Nebraska	46.9	51.7	54.7	62.3	73.3	52.4	55.4	52.4	63.0	70.0	2.4	2.2	2.4	4.1	4.9	64.4	65.8	60.5	64.7	70.9
Nevada	69.5	81.9	103.0	120.2	143.5	69.5	42.3	63.7	69.7	100.9	3.6	3.7	4.7	4.8	6.8	58.7	49.5	72.1	78.2	81.5
New Jersey	44.5	44.2	57.8	70.0	71.2	54.5	56.4	59.2	60.3	61.2	2.3	2.8	3.1	3.3	3.6	77.0	67.7	73.4	74.1	79.5
New Mexico	58.4	83.9	79.1	107.9	124.4	85.9	89.4	96.3	127.3	126.0	41.7	38.0	43.3	74.4	63.9	46.6	44.3	50.8	45.7	57.6
New York	45.5	55.3	61.5	86.0	87.5	57.1	59.2	60.4	66.3	67.2	3.0	4.3	4.6	5.8	6.0	65.6	65.7	69.2	74.0	77.5
North Carolina	57.0	61.4	78.3	85.2	101.7	52.1	63.5	76.6	71.7	65.6	13.1	19.0	29.5	24.9	23.7	95.7	82.4	88.2	85.4	98.1
North Dakota	40.2	54.8	54.5	72.7	59.6	49.1	53.7	53.1	59.4	72.3	5.8	7.0	7.6	10.9	13.1	43.5	41.0	44.0	38.5	44.6
Ohio	56.0	60.0	60.8	84.9	89.2	52.8	55.5	57.8	66.7	70.6	4.4	5.1	6.8	8.0	8.2	77.1	75.6	75.5	77.8	85.9
Oklahoma	57.4	61.3	62.1	78.6	98.1	59.7	64.6	61.0	70.7	75.8	10.4	9.4	10.3	14.1	16.4	61.9	54.7	61.6	67.1	62.2
Oregon	(1)	40.5	51.4	61.4	91.4	(1)	44.7	45.0	51.1	61.8	(1)	2.1	2.0	1.6	2.2	(1)	112.4	106.1	104.2	102.1
Pennsylvania	50.8	50.2	60.4	79.4	85.3	52.1	52.5	55.6	57.6	55.6	3.8	4.5	5.4	6.2	6.0	94.4	82.0	83.0	87.6	84.8
Rhode Island	54.0	57.4	79.2	93.2	95.4	55.2	60.3	60.7	59.7	60.9	2.0	4.0	5.1	5.1	3.8	98.0	96.1	102.4	106.8	106.6
South Carolina	67.9	64.0	85.9	93.0	104.8	51.7	43.3	39.4	39.1	42.1	6.5	7.0	11.1	9.1	16.4	92.8	88.5	90.7	93.2	94.9
South Dakota	36.5	54.8	55.5	73.4	68.6	53.8	60.0	55.0	57.0	62.6	5.1	5.4	5.7	4.8	10.5	48.2	42.8	40.6	46.1	62.8
Tennessee	71.0	70.6	80.6	95.4	119.8	58.8	64.7	75.8	76.9	82.0	10.6	12.8	22.1	18.0	20.8	64.5	59.8	63.8	66.7	69.4
Texas	52.5	53.0	68.9	85.5	99.5	80.7	78.4	67.4	74.8	91.4	29.1	25.7	24.6	31.1	26.5	58.3	53.0	56.4	59.4	61.0

Utah	43.5	45.2	63.1	61.5	92.4	54.8	53.4	63.3	65.5	75.2	3.6	2.2	5.3	3.7	9.5	49.9	53.9	52.2	55.2	56.5
Vermont	70.4	79.1	79.1	103.7	118.3	50.9	51.0	53.5	51.0	73.2	4.7	3.6	2.8	2.8	5.6	76.5	79.7	81.4	77.5	93.2
Virginia	69.5	67.3	71.8	98.3	97.2	48.2	53.1	60.0	53.8	59.8	8.8	11.1	16.2	12.8	13.8	105.0	85.3	83.8	86.8	94.7
Washington	47.8	50.7	65.6	68.5	75.6	56.5	52.2	58.3	56.8	65.2	2.2	2.2	3.1	3.1	3.2	71.3	63.8	66.4	74.1	73.0
West Virginia	59.7	61.8	70.1	92.8	108.9	46.2	62.3	71.3	72.1	91.7	8.3	18.1	26.2	20.0	31.6	69.3	65.6	70.0	66.9	67.1
Wisconsin	46.5	47.8	54.5	64.4	73.1	([1])	51.0	50.5	51.6	63.8	3.2	4.6	4.8	4.5	5.8	57.7	56.7	59.5	65.5	67.0
Wyoming	39.4	49.9	62.6	111.3	109.4	51.7	63.1	67.5	71.1	77.9	6.0	6.0	8.9	13.6	11.2	52.5	69.6	54.5	39.4	51.4
Alaska	144.2	169.0	186.3	159.6	([1])	28.6	41.6	38.1	56.1	([1])	4.1	([2])	([2])	8.6	([1])	23.1	27.7	16.9	15.8	([1])
Hawaii	45.8	54.1	75.1	93.3	75.0	48.2	53.2	54.9	66.1	71.5	5.7	11.1	12.4	19.0	22.2	66.9	65.2	62.7	72.1	68.7

State	All accidents, including automobile accidents (169–195)					Automobile accidents only (170a, b, c)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
Alabama	57.2	70.9	69.8	75.8	72.8	20.8	22.0	21.2	24.4	25.0
California	([1])	89.4	90.4	100.4	100.4	([1])	41.2	41.0	47.8	47.8
Colorado	91.3	87.4	88.6	92.2	103.1	32.7	28.6	30.6	35.1	36.3
Connecticut	55.1	61.3	72.2	71.0	69.7	18.0	20.7	19.8	24.9	25.7
Delaware	79.0	71.9	80.4	107.6	94.5	36.3	29.1	26.8	43.3	34.0
District of Columbia	72.2	75.6	64.6	84.1	82.0	22.2	22.8	20.7	28.4	33.6
Florida	96.4	93.1	92.7	105.1	102.3	36.9	36.5	39.4	42.8	41.6
Georgia	63.6	55.9	67.3	75.9	90.5	24.8	19.9	24.9	29.8	32.3
Idaho	100.6	97.4	88.2	102.6	111.4	36.4	33.7	33.5	36.0	38.4
Illinois	73.7	71.3	74.7	81.5	99.9	29.6	28.4	27.7	33.4	32.2
Indiana	82.1	72.3	74.3	89.5	108.2	33.4	29.3	31.6	40.7	37.7
Iowa	63.5	65.8	65.8	76.2	87.1	20.0	19.4	19.1	24.2	22.1
Kansas	75.3	103.5	106.5	117.1	97.5	27.2	23.1	24.6	27.6	31.4
Kentucky	77.7	77.4	65.5	75.2	85.8	26.0	23.0	22.0	27.5	23.8
Louisiana	67.7	64.0	66.0	64.6	78.2	23.2	20.3	20.7	21.1	27.2
Maine	75.4	71.8	69.0	76.3	83.5	23.6	22.1	22.2	19.1	24.3
Maryland	79.4	69.8	68.6	87.7	84.9	28.3	22.0	21.7	30.6	27.6
Massachusetts	61.3	63.1	61.4	65.3	69.9	15.2	15.4	15.4	19.3	19.9
Michigan	74.9	72.4	70.8	90.1	99.7	32.6	27.3	27.5	40.0	40.1
Minnesota	68.0	67.6	67.8	72.9	97.8	21.9	21.6	23.4	24.2	26.8
Mississippi	70.2	59.8	63.3	65.4	75.1	20.1	19.4	19.3	21.7	23.2
Missouri	([1])	72.5	72.1	84.6	101.4	([1])	21.6	23.4	29.5	27.8
Montana	94.1	94.2	101.6	105.3	119.7	27.7	27.1	24.1	32.4	31.2
Nebraska	65.2	69.0	59.0	68.2	79.3	19.9	21.3	17.4	24.6	23.1
Nevada	173.4	190.4	134.8	152.7	178.5	76.8	69.9	56.2	57.3	71.8

State	All accidents, including automobile accidents (169–195)					Automobile accidents only (170a, b, c)				
	1940	1939	1938	1937	1936	1940	1939	1938	1937	1936
New Jersey	64.7	59.1	61.5	76.0	72.4	22.5	20.4	21.3	28.0	25.8
New Mexico	88.1	85.4	80.4	105.7	93.2	39.8	38.6	28.9	41.5	41.5
New York	62.1	61.9	63.4	71.3	70.2	18.0	17.8	18.3	22.2	20.8
North Carolina	65.3	65.2	63.2	72.7	71.4	27.5	26.2	25.1	30.2	18.4
North Dakota	53.5	51.8	55.7	63.8	70.8	18.1	14.4	19.0	20.9	20.6
Ohio	87.3	83.2	80.5	93.3	103.0	29.7	27.7	27.4	36.4	35.1
Oklahoma	56.7	82.3	73.3	66.7	81.7	19.7	22.2	23.8	26.2	27.8
Oregon	([1])	92.3	91.3	87.7	107.2	([1])	30.1	31.0	32.5	34.9
Pennsylvania	57.2	54.7	59.5	68.6	78.9	17.2	16.7	17.6	22.4	24.8
Rhode Island	51.4	51.4	91.4	55.0	58.1	12.2	10.9	11.3	17.8	16.5
South Carolina	76.7	69.1	63.4	60.7	75.9	31.5	27.9	24.8	28.2	31.7
South Dakota	64.7	54.8	66.3	63.1	73.1	19.5	21.5	21.4	16.6	19.2
Tennessee	62.2	62.0	62.0	69.9	78.9	18.6	19.4	19.8	25.1	27.7
Texas	69.1	61.5	72.3	86.6	81.4	27.0	23.3	28.3	33.7	32.0
Utah	83.8	78.6	93.7	95.0	88.9	33.4	29.8	39.8	37.6	34.6
Vermont	61.2	66.3	68.8	70.0	87.1	19.2	22.0	20.6	18.1	27.8
Virginia	82.9	74.4	70.7	73.6	86.3	31.1	30.2	25.2	29.2	32.2
Washington	93.7	87.8	82.6	97.3	109.5	30.6	27.3	28.5	32.5	37.8
West Virginia	88.5	79.2	80.2	95.8	103.6	20.8	18.8	20.1	25.0	27.9
Wisconsin	75.0	76.3	68.4	79.4	86.5	24.2	22.8	22.3	28.4	25.2
Wyoming	106.2	113.4	109.3	124.5	126.8	53.7	47.4	39.4	51.3	47.2
Alaska	142.8	144.1	175.0	178.3	([1])	([2])	([2])	([2])	1.4	([1])
Hawaii	54.8	47.6	58.8	57.1	59.4	13.9	14.2	18.3	16.7	20.4

[1] Data not available.
[2] No deaths reported.

COURT DECISION ON PUBLIC HEALTH

Regulations of local board of health governing plumbers upheld.—(Georgia Court of Appeals, Division No. 1; *Abel* v. *State*, 13 S.E.2d 507; decided March 5, 1941.) In a case where a person was charged with unlawfully following the occupation of plumbing there was presented the question as to whether the regulations of a joint county and city board of health which were claimed to have been violated were so unreasonable as to make them invalid and void. These regulations, adopted pursuant to statutory authority, required that a plumber (*a*) furnish a guarantee bond in the amount of $3,000 for the faithful observance of the plumbing rules of the board of health, (*b*) obtain a bond permit, and (*c*) register in a book kept by the board of health for that purpose. The court of appeals was of the view that none of these requirements was unreasonable and affirmed the overruling by the lower court of a demurrer to the accusation.

DEATHS DURING WEEK ENDED MAY 10, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 10, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,279	8,607
Average for 3 prior years	8,106	
Total deaths, first 19 weeks of year	174,521	175,321
Deaths per 1,000 population, first 19 weeks of year, annual rate	12.8	12.9
Deaths under 1 year of age	478	524
Average for 3 prior years	523	
Deaths under 1 year of age, first 19 weeks of year	10,098	9,722
Data from industrial insurance companies:		
Policies in force	64,517,124	65,650,862
Number of death claims	12,394	12,077
Death claims per 1,000 policies in force, annual rate	10.0	9.6
Death claims per 1,000 policies, first 19 weeks of year, annual rate	10.5	10.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 17, 1941

Summary

A decrease was recorded in the number of cases of measles reported for the country as a whole, 37,941 as compared with 39,754 for the preceding week, although slight increases were shown for the New England and Middle Atlantic States, principally in Maine, Massachusetts, and Pennsylvania. The incidence declined in all other geographic areas. The Middle Atlantic, East North Central, and South Atlantic areas continue to record the highest incidence rates. A total of 660,958 cases of measles has been reported to date this year (first 20 weeks), as compared with 638,671 for the corresponding period in 1938.

The number of cases of smallpox increased from 37 for the preceding week to 63, of which more than half (34) occurred in the West North Central States, 21 in South Dakota, where no cases were reported last week. Kentucky reported 9 cases, none last week.

Of a total of 24 cases of Rocky Mountain spotted fever, 4 occurred in eastern States (1 each in New York and Maryland and 2 in Virginia) and 20 in the western area (8 in Wyoming and 5 in Montana). To date 108 cases have been reported in 1941 as compared with 65 in 1940 and 100 in 1939 for the corresponding period.

The number of cases of poliomyelitis dropped from 22 to 18, with Arizona (3) and California (2) the only States reporting more than 1 case.

Of the nine communicable diseases included in the following table, the current incidence of only influenza, measles, and whooping cough was above the 5-year (1936–40) median.

One case of endemic typhus fever was reported in New York, 1 case in California, and 22 cases in the southern States.

Two rats taken in Richmond, Contra Costa County, Calif., in April were reported to have been found plague-infected.

The mortality in large cities continues low. The death rate for the current week in 88 major cities in the United States, as reported by the Bureau of the Census, was 11.3 per 1,000 population, as compared with 11.6 for the preceding week and with a 3-year (1938–40) average of 11.7. The cumulative rate for the first 20 weeks is 12.7, as compared with 12.8 in 1940 (all rates on an annual basis).

Telegraphic morbidity reports from State health officers for the week ended May 17, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940	
NEW ENG.												
Maine	0	1	1	------	------	1	141	417	155	0	0	0
New Hampshire	0	0	0	------	------	------	40	7	34	0	0	0
Vermont	0	0	0	------	------	------	45	1	83	0	0	0
Massachusetts	2	6	6	------	------	------	1,053	766	766	0	1	4
Rhode Island	0	0	0	------	------	------	4	162	80	0	0	0
Connecticut	0	8	2	------	------	3	467	35	189	0	0	0
MID. ATL.												
New York [1,2]	16	18	26	[3] 4	[3] 14	[3] 7	4,134	923	2,251	5	6	8
New Jersey	5	8	10	5	5	5	2,499	887	845	0	1	1
Pennsylvania	16	15	22	------	------	------	5,921	498	616	1	11	8
E. NO. CEN.												
Ohio	4	16	12	11	30	24	3,001	29	542	1	0	1
Indiana	4	3	7	9	1	12	1,097	13	36	1	0	1
Illinois	8	15	25	13	2	17	1,704	203	203	0	0	4
Michigan [4]	5	3	12	2	2	------	3,035	802	564	1	0	0
Wisconsin	1	2	2	15	44	48	2,021	1,065	816	3	0	1
W. NO. CEN.												
Minnesota	23	3	2	1	9	1	24	89	206	1	0	0
Iowa	2	4	5	4	------	------	205	284	152	0	2	1
Missouri	2	5	10	1	2	9	590	31	31	1	1	1
North Dakota	1	1	0	------	2	3	41	3	3	0	0	0
South Dakota	0	3	1	------	------	------	17	1	1	0	0	0
Nebraska	0	5	1	------	------	------	21	12	41	0	0	0
Kansas	1	3	5	15	1	3	771	453	79	0	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	137	4	14	0	0	0
Maryland [1,4]	6	1	4	3	4	3	400	5	318	3	1	1
Dist. of Col	0	2	3	------	------	------	251	3	107	0	0	1
Virginia [1]	9	11	7	52	108	68	1,149	203	413	2	6	5
West Virginia [4]	10	7	5	10	16	24	621	30	74	0	0	2
North Carolina	9	6	11	6	2	3	1,622	107	272	0	1	1
South Carolina	5	5	4	327	179	126	751	31	31	0	0	0
Georgia [2]	2	2	4	23	40	------	550	109	109	0	0	1
Florida [2]	5	3	3	45	2	3	357	83	78	1	0	0
E. SO. CEN.												
Kentucky	3	4	6	------	46	9	1,057	152	152	2	0	9
Tennessee [2]	2	4	4	37	45	45	425	166	113	3	3	2
Alabama [2]	1	3	5	49	53	53	400	100	100	1	1	1
Mississippi [4]	3	6	5	------	------	------	------	------	------	4	4	1
W. SO. CEN.												
Arkansas	3	3	4	8	34	29	371	52	52	0	0	0
Louisiana [2]	2	7	10	4	7	7	52	14	27	0	1	1
Oklahoma [1]	1	8	6	22	28	51	74	15	86	0	1	1
Texas [2]	16	28	34	510	199	211	1,106	1,580	432	2	4	4
MOUNTAIN												
Montana [1]	0	0	0	1	10	21	36	78	62	0	0	0
Idaho [1]	0	1	0	------	------	1	12	19	23	0	0	0
Wyoming [1]	0	0	0	1	------	------	30	28	26	0	0	0
Colorado [1]	7	6	6	14	4	------	641	78	78	0	0	0
New Mexico	1	0	0	------	8	8	212	99	82	0	1	1
Arizona	2	2	0	65	53	47	125	187	46	0	0	0
Utah [4]	1	0	0	12	------	------	63	607	151	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	0	0	------	------	------	21	486	414	0	0	0
Oregon	2	4	3	8	15	19	197	503	78	0	0	0
California [2]	13	11	26	72	49	44	450	420	978	1	2	2
Total	194	238	353	1,349	1,014	1,014	37,941	11,840	12,781	33	48	50
20 weeks	5,452	6,650	9,628	587,421	163,176	145,395	660,958	150,987	194,175	972	832	1,592

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 17 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940		May 17, 1941	May 18, 1940	
NEW ENG.												
Maine	0	0	0	12	8	21	0	0	0	0	1	1
New Hampshire	0	0	0	1	0	4	0	0	0	0	0	0
Vermont	0	0	0	9	8	8	0	0	0	0	0	0
Massachusetts	0	1	0	214	189	218	0	0	0	11	3	2
Rhode Island	0	0	0	20	7	15	0	0	0	0	1	1
Connecticut	0	0	0	41	107	86	0	0	0	0	0	1
MID. ATL.												
New York [1] [2]	0	0	1	488	1,042	774	0	0	0	9	11	8
New Jersey	1	0	0	274	388	229	0	0	0	2	1	3
Pennsylvania	1	2	1	388	389	389	0	0	0	5	16	5
E. NO. CEN.												
Ohio	0	0	0	228	351	274	0	0	0	4	0	5
Indiana	0	0	0	82	85	115	1	4	19	0	3	3
Illinois	1	0	1	298	744	570	6	1	16	4	4	6
Michigan [4]	0	0	0	255	385	385	0	1	4	5	2	4
Wisconsin	0	0	0	127	130	139	2	1	3	0	0	0
W. NO. CEN.												
Minnesota	0	0	0	55	70	127	0	1	8	1	0	0
Iowa	0	1	0	29	41	96	8	5	26	1	0	1
Missouri	0	1	0	160	52	127	3	0	24	0	2	2
North Dakota	0	0	0	2	12	23	0	1	3	0	0	0
South Dakota	1	0	0	14	5	12	21	1	11	0	0	0
Nebraska	0	0	0	8	10	25	1	0	5	0	0	0
Kansas	0	0	0	19	49	98	1	1	6	1	1	1
SO. ATL.												
Delaware	0	0	0	12	4	4	0	0	0	0	0	0
Maryland [1] [4]	0	0	0	33	49	43	0	0	0	4	0	2
Dist. of Col.	0	0	0	11	33	14	0	0	0	1	0	0
Virginia [1]	1	0	0	19	31	18	0	0	0	4	2	5
West Virginia [4]	0	1	0	34	38	35	1	0	0	2	6	5
North Carolina	0	1	1	16	22	17	1	0	0	2	0	4
South Carolina	0	0	0	12	2	2	0	0	0	1	1	3
Georgia [2]	0	0	0	16	16	16	4	2	0	6	5	6
Florida [2]	1	0	0	2	6	6	0	0	0	4	2	5
E. SO. CEN.												
Kentucky	0	1	0	115	49	47	9	1	1	6	5	5
Tennessee [2]	0	0	0	43	65	21	0	1	1	5	5	5
Alabama [2]	1	0	0	13	7	5	0	10	0	1	7	6
Mississippi [4]	1	3	0	0	7	5	0	2	1	0	2	2
W. SO. CEN.												
Arkansas	1	0	0	3	6	6	1	1	1	1	2	2
Louisiana [2]	1	0	1	3	6	7	0	0	0	6	7	7
Oklahoma [1]	1	0	0	14	6	16	0	0	4	3	2	5
Texas [2]	1	0	1	34	33	46	0	5	7	7	5	9
MOUNTAIN												
Montana [1]	0	0	0	15	19	17	0	0	5	0	1	1
Idaho [1]	0	0	0	1	10	10	0	0	3	0	1	1
Wyoming [1]	0	0	0	9	5	5	0	0	0	0	0	0
Colorado [1]	0	1	0	23	38	38	2	16	3	1	3	1
New Mexico	0	0	0	0	2	7	0	0	0	3	1	0
Arizona	8	0	0	3	9	10	0	0	0	1	1	2
Utah [4]	0	2	0	9	20	20	0	0	0	0	1	1
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	7	0	24	46	46	1	0	5	0	0	0
Oregon	0	1	0	7	8	22	1	1	8	0	1	2
California [2]	2	4	3	105	134	166	0	6	12	1	5	5
Total	18	26	21	3,300	4,743	4,743	63	61	237	102	110	150
20 weeks	464	467	404	73,548	96,417	113,890	921	1,441	6,239	1,583	1,670	2,265

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 17, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended— May 17, 1941	Whooping cough, Week ended— May 18, 1940
NEW ENG.		
Maine	36	22
New Hampshire	13	14
Vermont	28	27
Massachusetts	257	176
Rhode Island	29	9
Connecticut	93	33
MID. ATL.		
New York [1] [3]	257	322
New Jersey	134	112
Pennsylvania	392	276
E. NO. CEN.		
Ohio	452	203
Indiana	35	35
Illinois	108	110
Michigan [4]	389	215
Wisconsin	125	135
W. NO. CEN.		
Minnesota	101	51
Iowa	50	30
Missouri	78	19
North Dakota	29	2
South Dakota	19	1
Nebraska	18	8
Kansas	169	30
SO. ATL.		
Delaware	5	6
Maryland [1] [4]	77	127
District of Columbia	23	5
Virginia [1]	140	57
West Virginia [4]	46	50
North Carolina	276	112
SO. ATL.—continued		
South Carolina	163	21
Georgia [2]	58	28
Florida [2]	21	11
E. SO. CEN.		
Kentucky	67	115
Tennessee [2]	99	45
Alabama [2]	51	16
Mississippi [4]	------	--------
W. SO. CEN.		
Arkansas	50	11
Louisiana [2]	14	24
Oklahoma [1]	26	26
Texas [2]	300	366
MOUNTAIN		
Montana [1]	24	2
Idaho [1]	22	23
Wyoming [1]	6	3
Colorado [1]	249	13
New Mexico	27	48
Arizona	43	23
Utah [4]	100	217
Nevada	1	--------
PACIFIC		
Washington	177	43
Oregon	42	8
California [2]	774	501
Total	5,693	3,731
20 weeks	91,181	62,687

[1] Rocky Mountain spotted fever, week ended May 17, 1941, 24 cases, as follows: New York, 1; Maryland 1; Virginia, 2; Oklahoma, 1; Montana, 5, Idaho, 2, Wyoming, 8; Colorado, 4

[2] Typhus fever, week ended May 17, 1941, 24 cases, as follows New York, 1, Georgia, 7; Florida, 3; Tennessee, 1; Alabama, 3; Louisiana, 1; Texas, 7; California, 1.

[3] New York City only.

[4] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 3, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	116	125	49	5,124	577	1,994	19	386	23	1,235	-------
Current week [1]	54	76	20	11,876	318	1,430	0	387	14	1,495	-------
Maine:											
Portland	0	-----	0	1	2	0	0	0	0	6	16
New Hampshire:											
Concord	0	-----	0	4	0	0	0	0	0	0	8
Manchester	0	-----	0	0	0	0	0	0	0	0	6
Nashua	0	-----	0	0	0	0	0	0	0	5	7
Vermont:											
Barre	0	-----	0	0	1	0	0	0	0	0	4
Burlington	0	-----	0	7	0	0	0	0	0	0	9
Rutland	0	-----	0	0	0	0	0	0	0	0	2
Massachusetts:											
Boston	0	-----	1	302	7	94	0	10	1	34	221
Fall River	1	-----	0	2	1	4	0	0	0	7	31
Springfield	0	-----	0	27	0	9	0	0	0	13	35
Worcester	0	-----	0	31	4	7	0	8	1	8	47
Rhode Island:											
Pawtucket	0	-----	0	0	0	3	0	0	0	1	14
Providence	2	2	0	2	3	3	0	3	0	17	57
Connecticut:											
Bridgeport	0	-----	0	21	0	7	0	0	0	0	26
Hartford	1	-----	0	3	2	4	0	2	0	2	29
New Haven	0	1	0	7	0	18	0	0	0	13	21
New York:											
Buffalo	0	-----	1	74	6	47	0	7	0	16	127
New York	17	5	1	3,377	66	278	0	87	1	74	1,459
Rochester	0	-----	0	228	2	1	0	0	0	13	53
Syracuse	0	-----	0	0	2	3	0	0	0	12	43
New Jersey:											
Camden	0	-----	0	18	3	20	0	0	0	2	28
Newark	0	3	0	141	0	47	0	9	0	18	93
Trenton	0	1	0	42	1	32	0	5	0	3	32
Pennsylvania:											
Philadelphia	1	1	0	707	16	119	0	41	0	59	486
Pittsburgh	4	2	3	1,001	6	17	0	11	1	49	166
Reading	0	-----	0	85	0	5	0	1	0	2	24
Scranton	0	-----	-------	31	-------	0	0	-------	0	0	-------
Ohio:											
Cincinnati	1	1	0	163	1	69	0	6	0	5	122
Cleveland	0	4	0	173	15	40	0	11	0	86	187
Columbus	0	1	1	198	3	12	0	1	0	60	75
Toledo	0	-----	0	393	3	2	0	1	0	19	70
Indiana:											
Anderson	1	-----	0	-------	0	0	0	0	0	0	7
Fort Wayne	0	-----	0	25	1	1	0	0	0	3	32
Indianapolis	1	-----	0	540	3	21	0	2	0	29	101
Muncie	0	-----	0	42	2	3	0	0	0	1	16
South Bend	0	-----	0	33	2	2	0	0	0	0	17
Terre Haute	0	-----	0	3	0	0	0	0	0	0	13
Illinois:											
Alton	0	-----	0	2	0	3	0	0	0	0	10
Chicago	5	2	2	518	22	157	0	34	0	34	704
Elgin	1	-----	0	37	0	1	0	0	0	0	5
Moline	0	-----	0	31	0	2	0	0	0	1	10
Springfield	0	-----	0	11	3	3	0	0	0	0	14
Michigan:											
Detroit	0	2	0	728	9	101	0	13	0	186	261
Flint	0	-----	0	137	2	3	0	0	0	10	25
Grand Rapids	0	-----	0	319	3	9	0	1	0	1	36
Wisconsin:											
Kenosha	0	-----	0	143	0	1	0	0	0	0	8
Madison	0	-----	0	28	0	4	0	0	0	1	-------
Milwaukee	-------	-----	-------	-------	-------	-------	-------	-------	-------	-------	-------
Racine	0	-----	0	84	0	4	0	0	1	3	8
Superior	0	-----	0	0	0	0	0	0	0	10	12
Minnesota:											
Duluth	0	-----	0	0	1	0	0	0	0	19	28
Minneapolis	2	-----	0	13	8	15	0	2	0	24	85
St. Paul	0	-----	0	8	1	6	0	3	0	30	73

[1] Figures for Milwaukee and Fargo estimated; reports not received.

City reports for week ended May 3, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0	------	------	6	------	0	0	------	0	0	------
Davenport	0	------	------	10	------	1	0	------	0	0	------
Des Moines	0	------	------	14	------	4	0	------	0	2	35
Sioux City	0	------	------	7	------	0	0	------	0	17	------
Waterloo	0	------	------	47	------	1	0	------	0	4	------
Missouri:											
Kansas City	0	------	0	104	5	12	0	1	0	6	95
St. Joseph	1	------	0	13	2	1	0	0	0	0	24
St. Louis	0	1	1	279	11	89	0	4	2	42	207
North Dakota:											
Fargo	------	------	------	------	------	------	------	------	------	------	------
Grand Forks	0	------	------	1	------	0	0	------	0	0	------
Minot	0	------	------	10	------	0	0	------	0	2	8
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	1	------
Sioux Falls	0	------	------	0	------	6	0	------	0	0	------
Nebraska:											
Lincoln	0	------	------	2	------	2	0	------	0	0	------
Omaha	0	------	0	7	0	7	0	1	0	0	45
Kansas:											
Lawrence	0	------	0	12	0	0	0	0	0	4	2
Topeka	0	------	0	138	1	0	0	0	0	8	17
Wichita	2	1	0	4	1	4	0	0	0	16	24
Delaware:											
Wilmington	0	------	0	27	1	8	0	1	0	0	24
Maryland:											
Baltimore	0	1	0	162	14	16	0	15	0	59	221
Cumberland	0	------	0	3	0	1	0	0	0	2	13
Frederick	0	------	0	2	0	1	0	0	0	2	4
Dist. of Col.:											
Washington	0	------	0	299	1	13	0	17	2	24	165
Virginia:											
Lynchburg	0	------	0	0	0	0	0	0	0	3	6
Norfolk	0	------	0	209	1	1	0	0	0	1	29
Richmond	0	------	0	88	2	1	0	1	0	0	50
Roanoke	0	------	0	22	1	0	0	0	0	8	19
West Virginia:											
Charleston	0	------	0	3	0	1	0	0	0	0	7
Huntington	0	------	------	133	------	2	0	------	0	2	------
Wheeling	0	------	0	72	2	0	0	1	0	3	19
North Carolina:											
Gastonia	0	------	------	24	------	0	0	------	0	6	------
Raleigh	0	------	0	17	0	0	0	1	0	8	10
Wilmington	0	------	0	9	1	0	0	1	0	17	12
Winston-Salem	0	------	0	12	0	0	0	0	0	7	15
South Carolina:											
Charleston	0	4	1	13	3	0	0	0	2	0	23
Florence	0	------	0	0	0	0	0	0	0	3	5
Greenville	0	------	0	17	3	1	0	0	0	4	18
Georgia:											
Atlanta	0	2	0	18	3	1	0	4	0	0	79
Brunswick	0	------	0	18	3	0	0	0	0	0	4
Savannah	0	1	0	19	2	9	0	3	0	1	29
Florida:											
Miami	0	3	------	14	------	0	0	------	1	10	------
St. Petersburg	0	------	0	21	0	0	0	0	0	0	17
Tampa	0	1	1	0	0	1	0	0	0	0	30
Kentucky:											
Ashland	0	------	0	6	1	0	0	2	0	0	9
Covington	0	------	0	4	0	4	0	------	0	0	16
Lexington	0	------	0	4	0	2	0	1	0	4	16
Tennessee:											
Knoxville	0	------	0	61	0	3	0	0	0	2	24
Memphis	0	------	3	123	2	2	0	6	0	14	90
Nashville	0	------	1	102	6	3	0	0	0	5	41
Alabama:											
Birmingham	0	1	0	37	5	5	0	6	0	0	64
Mobile	1	2	0	1	4	0	0	0	0	0	23
Montgomery	0	------	------	30	------	0	0	------	0	2	------
Arkansas:											
Fort Smith	0	------	------	10	------	2	0	------	0	0	------
Little Rock	0	7	0	22	5	1	0	3	0	3	37
Louisiana:											
Lake Charles	0	------	0	3	0	0	0	0	0	0	2
New Orleans	2	------	1	10	6	2	0	13	0	3	135
Shreveport	0	------	0	2	5	2	0	3	0	0	60

City reports for week ended May 3, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	1	2	1	16	2	3	0	0	0	0	40
Tulsa	0	------	0	33	1	0	0	1	0	4	25
Texas:											
Dallas	2	2	0	65	1	9	0	1	0	12	58
Fort Worth	0	------	1	14	4	0	0	0	0	7	86
Galveston	0	------	0	3	2	1	0	0	0	0	13
Houston	0	------	0	3	7	0	0	4	0	0	67
San Antonio	0	2	1	1	2	0	0	12	0	2	68
Montana:											
Billings	0	------	0	0	1	2	0	0	0	0	4
Great Falls	0	------	0	0	1	2	0	0	0	0	10
Helena	0	------	0	0	0	0	0	0	0	0	------
Missoula	0	------	0	0	0	1	0	0	0	0	3
Idaho:											
Boise	0	------	0	23	0	0	0	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	7	0	3	0	1	0	3	16
Denver	7	5	1	415	6	5	0	4	1	150	87
Pueblo	0	------	0	8	1	2	0	0	0	35	17
Arizona:											
Phoenix	0	26	------	3	------	0	0	------	0	1	------
Utah:											
Salt Lake City	1	------	0	6	2	4	0	2	0	16	45
Washington:											
Seattle	1	------	0	2	1	1	0	1	0	40	84
Spokane	0	------	0	9	0	3	0	0	0	3	27
Tacoma	0	------	0	0	2	0	0	0	0	6	26
Oregon:											
Portland	2	2	1	8	2	5	0	2	0	1	92
Salem	0	1	------	1	------	0	0	------	0	0	------
California:											
Los Angeles	1	15	0	54	3	28	0	13	0	44	377
Sacramento	1	3	0	4	2	1	0	4	2	20	28
San Francisco	0	2	0	7	5	9	0	10	0	41	177

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				**Maryland:**			
Worcester	1	0	0	Baltimore	3	0	0
Connecticut:				**West Virginia:**			
Bridgeport	1	0	0	Huntington	1	1	0
New York:				**Florida:**			
Buffalo	0	1	0	Miami	0	0	1
New York	4	3	0	**California:**			
Pennsylvania:				Los Angeles	0	0	2
Pittsburgh	1	0	1				
Illinois:							
Chicago	1	1	0				

Encephalitis, epidemic or lethargic.—Cases: Philadelphia, 2; Pittsburgh, 1; Aberdeen, 1; Norfolk, 1. Deaths: New York, 1; Norfolk, 1.

Pellagra.—Cases: Boston, 1; St. Louis, 1; Savannah, 2.

Rabies in man.—Deaths: Pittsburgh, 1.

Typhus fever.—Cases: St. Petersburg, 1; Tampa, 1; New Orleans, 1; San Antonio, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on April 10, 1941, at Paauhau in the Paauhau area of Hamakua District, Island of Hawaii, has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 12, 1941.—During the week ended April 12, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	9	11	10	5	18	1	1	8	5	68
Chickenpox		13	2	132	174	26	44	27	50	468
Diphtheria		10	2	10	41	1		9		73
Dysentery				1						1
Influenza		38			6				27	71
Measles		158	10	290	1,181	56	157	116	781	2,749
Mumps		5		330	253	25	26	14	43	696
Pneumonia		23			6		2		3	34
Poliomyelitis				1						1
Scarlet fever		32	12	84	211	5	4	1	21	370
Tuberculosis		3	14	59	30	1	17			124
Typhoid and paratyphoid fever		1	3	10	1					15
Whooping cough		1		93	94	1	5	8	15	217

CUBA

Habana—Communicable diseases—4 weeks ended April 5, 1941.—During the 4 weeks ended April 5, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	22		Tuberculosis		2
Scarlet fever	3		Typhoid fever	18	2

Provinces—Notifiable diseases—4 weeks ended March 29, 1941.—During the 4 weeks ended March 29, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		5	8	1	5	20
Chickenpox		3	2		1		6
Diphtheria		11	1	1		4	17
Hookworm disease		8					8
Leprosy				2		1	3
Malaria	30	1		19	1	129	180
Measles	1	4	14	1	93		113
Rabies			1				1
Scarlet fever		3		1			4
Tuberculosis	19	44	30	40	4	61	198
Typhoid fever	21	50	10	10	15	48	154
Whooping cough		8				7	15

SWEDEN

Notifiable diseases—February 1941.—During the month of February 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	5	Poliomyelitis	8
Diphtheria	23	Scarlet fever	906
Dysentery	1	Syphilis	18
Gonorrhea	623	Typhoid fever	4
Paratyphoid fever	7	Undulant fever	11

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of April 25, 1941, pages 924-928. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China—Macao.—During the week ended May 3, 1941, 10 cases of cholera were reported in Macao, China.

India—Chittagong.—During the week ended May 10, 1941, cholera was reported present in Chittagong, India.

Plague

China—Foochow.—A report dated May 6, 1941, stated that several cases of human and rodent plague had been reported in Foochow, China.

Typhus Fever

Spain.—Typhus fever has been reported in Spain as follows: Week ended April 5, 1941, 343 cases, including 234 cases in Madrid, 33 in Seville, and 18 in Malaga. Week ended April 12, 1941, 234 cases, including 163 in Madrid, 13 in Seville, and 16 in Malaga. For the period January 26 to April 12, 1941, 968 cases of typhus fever with 131 deaths were reported.

Yellow Fever

Gold Coast—Accra.—On April 2, 1941, 1 case of yellow fever with 1 death was reported in Accra, Gold Coast.

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Public Health Reports

VOLUME 56 MAY 30, 1941 NUMBER 22

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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THE RESPONSIBILITY OF THE NURSING PROFESSION IN INDUSTRIAL HYGIENE[1]

By J. J. BLOOMFIELD, *Sanitary Engineer, United States Public Health Service*

It is well known that environmental conditions in certain workplaces can contribute to diseases among workers which are unique to a particular occupation and which do not exist in the nonindustrial population. However, it is also well known that occupational accidents and specific occupational diseases, while constituting an important problem in industrial hygiene, do not account for the major part of the time lost because of disability. It is apparent, therefore, that in addition to the problem of controlling accidents and occupational diseases, there exists also the important task of controlling the diseases which are just as common, and more important economically, among industrial workers as in the general population. That is why industrial hygiene has been considered an important branch of the general field of public health. It is for this reason, too, that the nursing profession plays such an important role in industrial hygiene, since it is one of the chief concerns of that profession to assist in the promotion of better health in the community.

NATURE AND EXTENT OF PROBLEM

Before launching into a discussion of the nature and extent of the industrial hygiene problem, it should be clearly understood that the legal responsibility for protecting the health of those gainfully employed is a function of official public health agencies. Furthermore, for the attainment of practical results in this field of public health, we need the combined efforts of personnel from several of the scientific professions, especially those concerned with medicine, nursing, engineering, and chemistry. It is essential, therefore, that the various professions involved should clearly understand the functions of each,

[1] Presented before a Symposium on Industrial Public Health Nursing Services, Milwaukee, Wis., February 20-22, 1941.

approach the solution of problems in industrial hygiene as a joint effort, and cooperate with each other to the fullest extent.

If every plant had an adequate industrial health maintenance program, and if every State and local health department had a comprehensive industrial hygiene service, then the problem today would not be so difficult. However, recent studies made by the United States Public Health Service of health service facilities in a large number of industrial establishments (*1*), as well as those conducted by such agencies as the National Industrial Conference Board (*2*), the American College of Surgeons (*3*), and the Council on Industrial Health of the American Medical Association (*4*), indicate that such services are still far from meeting present needs. For example, in the Public Health Service analysis of approximately 17,000 establishments employing 1,500,000 workers in 15 representative States, it was found that only 15 percent of the employees were provided with the services of a full-time physician and only 22 percent with part-time services of a physician. It was also found that one-third of the workers surveyed had the services of a full-time nurse, while part-time nursing services were provided to only 1.5 percent of the workers in all of the industries studied. Insofar as the medical services are concerned, the data are sufficiently representative to permit the conclusion that nearly two-thirds of the industrial workers, when in need of medical services, look to the private practitioner of their choice. This is especially true with reference to the so-called nonoccupational disabilities. This fact definitely puts the responsibility upon the medical profession to acquaint itself with some of the problems in industrial hygiene. However, with respect to nursing services, it is apparent that the entire field of part-time services of this nature has been left unexplored and that nearly two-thirds of the industrial workers are without any provision of the services which a well trained public health nurse can render.

The survey data on medical services have been purposely presented, in order to call attention to the finding that nearly one-fourth of the workers were furnished with part-time medical services from physicians on call or those engaged on a part-time basis. It is a well-known fact that the physicians on call, and most of those who spend but 1 or 2 hours a day in an industrial plant, do not have the time to devote to a program of disease prevention. The responsibility for rendering certain services of a preventive nature, under proper supervision, to this large segment of the population is thus definitely placed on the plant nurse or on the public health nurse in the community.

Present activities in national defense have placed great stress on the importance of maintaining at a high level the health of industrial workers. It should, therefore, not be necessary today to justify industrial hygiene activities. However, lest the magnitude of the

problem be overlooked, it may be timely to reiterate certain pertinent facts.

Today there are still approximately 17,000 deaths from occupational accidents each year, 75,000 permanent disabilities, and nearly 1,500,000 temporary disabilities. Many problems arise from diseases peculiar to certain occupations, such as silicosis, lead poisoning, and the dermatoses, and there is every reason to expect many of these problems to be augmented as a result of increased industrial production. It is also known from many studies that industrial workers have higher rates of physical defects than nonindustrial workers, and with the shortage of skilled personnel now existing, there is the acute problem of finding ways and means of rehabilitating and absorbing some of these skilled workers who have become physically handicapped. We know that excessive mortality is especially notable among unskilled workers, and it has been well established that the average worker in this country loses approximately 10 days a year on account of sickness, and that the amount of time lost from general illnesses is about 15 times as great as the total amount of time lost from both accidents and occupational diseases. All of these problems will be greatly magnified with the present expansion in industrial production.

THE OBJECTIVES OF INDUSTRIAL HYGIENE

The preceding discussion of some of the problems in industrial hygiene which confront the Nation points rather definitely to the objectives of a practical program. These objectives may be conveniently divided into two parts:[2] (1) The general aim to protect and promote the health, safety, and efficiency of those persons who are gainfully employed; and (2) the specific aim to restore to health and normal functioning every ill or disabled worker, and to reduce death, illness, and disability among those gainfully employed.

The activities necessary for achieving the above objectives may also be considered from two viewpoints: (1) Those of a general nature, and (2) those of a more specific character.

General.—In general, the following activities may aid in the attainment of the objectives stated above:

1. Appreciation on the part of every employee and employer regarding his respective responsibility in the development and maintenance of good health and in the prevention of accidents.

[2] The U. S. Public Health Service, in cooperation with the National Organization for Public Health Nursing, has recently explored the entire field of public health objectives, especially as they relate to the functions of the public health nurse. The author has drawn freely on the material developed in this cooperative study as it relates to industrial hygiene, and has taken the liberty to rearrange some of it for the sake of presentation of the subject under discussion. It is the author's understanding that this material, which was furnished him by the Nursing Consultant of the Public Health Service engaged on this cooperative study, is still in rough draft and, hence, should not be considered as final.

2. The promotion of the well-being of the worker with particular consideration to such influences as wages and hours of work, mental and physical health, family and environmental conditions.

3. Provisions for the cooperative services of medicine, toxicology, dentistry, sanitation, safety, nursing, and social welfare.

4. Provision for interpretation and observance of legislative programs pertaining to the employment of women and children; safety and sanitation; compensation for accidents and occupational diseases.

5. A program that will promote community understanding, interest, and action in providing such educational facilities and services as are indicated in protecting and promoting the health and well-being of every gainfully employed individual and his family.

Specific activities.—The specific activities which should aid in achieving the objectives outlined herein have also been developed, and these are as follows:

1. An impartial health appraisal of every worker in order to correct remediable conditions and for suitable placement.

2. Control of unhealthful conditions and provisions for safety and good sanitation of the working environment.

3. Provision for prompt and continued treatment of sickness and accidents resulting from occupations.

4. The development of an industrial health program that will include the psychological, social, and economic factors that affect the worker.

5. Provision of a system for recording and following through each case of absenteeism resulting from illness or injury.

6. The utilization of all available community resources in the restoration of the worker to health and normal functioning, and in the rehabilitation of his family.

At this point in the discussion of the objectives of industrial hygiene there may be considered the role and the functions of the nurse in the achievement of the aims enumerated and the responsibility of the nursing profession in this important field of public health.

THE ROLE AND FUNCTIONS OF THE NURSING PROFESSION

It is generally conceded that the nurse in industry requires special training (*5*). It is felt that, regardless of whether the nurse working in industrial hygiene finds herself in an official agency, a nonofficial agency, or in industry, she should have some of the fundamental personal and professional qualifications listed in the article to which reference has just been made. It is obvious that an efficient industrial nurse must first of all be a good nurse; she must be thoroughly acquainted with industry and industrial processes, be well trained in public health, and have some knowledge of labor legislation, social problems, community welfare, and industrial hygiene practice. In

short, industrial nursing is as highly specialized a profession as are industrial medicine, public health administration, or similar professions requiring postgraduate training. Just how much will be expected from the nurse will depend in a large measure on her program and on herself. However, the nurse should be prepared to recognize industrial health hazards, and she should be professionally able to assist in the many duties involved in their control.

THE NURSE IN INDUSTRY

The tentative report recently prepared by the United States Public Health Service in cooperation with the National Organization for Public Health Nursing, to which reference has been previously made, lists the following 14 functions of the public health nurse in industrial hygiene:

1. Instructs employees and employers regarding their responsibility in improving and maintaining physical and mental fitness, efficiency, and a safe working environment.
2. Assists in the supervision and maintenance of good plant sanitation and safety.
3. Assists in arranging for complete medical and dental examination of all applicants for work, of employees who have been ill or disabled, and for periodic examination, particularly of those engaged in hazardous work.
4. Supplements the physician's instructions, following the examination, and assists, when indicated, in securing the necessary medical service.
5. Increases the efficiency and general well-being of the workers by helping to overcome such influences as fatigue, worry, mental strain, and friction in the home and plant.
6. Integrates the health service with other services by working jointly with all departments within the plant to insure a better understanding of the programs and problems of each division.
7. Assists in the interpretation of and compliance with various legislative measures affecting those in industry.
8. Assists the lunchroom manager in planning menus when the services of a nutrition specialist are not available.
9. Observes manifestations of deviations from normal health and functioning and reports them to the employer and to the physician.
10. Arranges, in accordance with approved medical instruction, for the care of emergency and minor injuries and illnesses occurring within the plant.
11. Demonstrates, continues to give, or supervises home nursing care of the worker and his family, in accordance with the policy of the company.
12. Assists, when indicated, in securing hospitalization and adequate aftercare of the disabled worker.
13. Works jointly with all community agencies in securing such psychological, social, and economic adjustment as may be needed for the worker and his family.
14. Promotes community understanding, interest, and action in the development of a good industrial hygiene program, including the provision of facilities and services needed to make such a program effective.

It may be appropriate at this point to expand further on several of the functions listed, so as to indicate some of the responsibilities confronting the nurse in industry. First, it is essential to call attention

to the fact that the nurse is often in a strategic position to enlist the cooperation of both employer and employee, not only in the prevention and control of the diseases arising out of the occupation, but also in the promotion of general health and mental well-being.

By now it should be obvious that one of the responsibilities of the nurse is to become thoroughly familiar with the various industrial processes in the plant, the occupational hazards, and the various methods in use for their control. In the small plant, where no medical and engineering control program is in effect, the nurse can conduct a thorough sanitary survey in order to acquaint herself with the plant health hazards. A sanitary survey may be likened to an inventory of the facilities afforded the worker while in the industrial environment, so that a knowledge of all the factors bearing on the health and happiness of the worker may be obtained. By the use of simple survey forms (*6*), the sanitary survey can be intelligently made by a nurse, even though she may have but limited technical knowledge of the medical and engineering phases of industrial hygiene. There are many industrial health problems which are not simple to recognize or to solve. However, there are also many which are easily recognized and solved, and which require but little expenditure of funds and very little effort for the eradication of the associated causes. The type of survey which can be conducted by the nurse not only often results in eliminating many sources of unpleasantness and ill health, but also gives the nurse the opportunity to familiarize herself thoroughly with the working environment. Thus, in her future dealings with workers in a dispensary or in their homes, she will have first-hand knowledge of each individual's working environment and how it may possibly be related to his existing disability.

Again, the nursing profession can make an important contribution to the field of industrial hygiene by stimulating the practice of preemployment and periodic physical examinations of workers in industry, and by calling attention to the necessity for correcting those physical defects revealed by the health examination. Apropos of health examinations, it is desired to call attention to a recent paper by Ruth W. Hubbard (*7*), in which she discusses the use of existing visiting nurse services for industrial workers in small plants, and in which she presents a very striking example of the influence the plant nurse can exercise in overcoming such factors as fatigue, worry, and mental strain. As she so aptly points out, the frequent appearance of the nurse in the plant gives the workers a sense of her familiarity with their problems, and gives them the assurance necessary to talk with her about these problems. She cites the example of an older employee who was concerned about the possibility of dismissal because of age and who was relieved of his anxiety and worry by the skillful handling of the problem on the part of the plant nurse.

The nurse can also contribute much to the plant industrial hygiene program by familiarizing herself with existing and pending legislation pertaining to the worker. Any rules and regulations for the control of health hazards in industry which may exist should be known by the nurse and she should assist in the interpretation of, and the compliance with, these rules and regulations. If an occupational disease law exists in the State in which the nurse works (and there are now 24 States which have occupational disease legislation), the nurse should cooperate with the official agency to whom reports of the occurrence of occupational diseases among workers must be made. It is obvious that unless such reports are made it will be practically impossible for the official agency to carry out its functions. The same attitude should be adopted toward the reporting of occupational diseases which now exists with regard to the reporting of communicable diseases. The recurrence of such diseases may be obviated by the prompt investigation on the part of a State industrial hygiene service of those conditions in the plant which may be the causative agent. Once the cause has been established, prompt measures may be taken for the control of the environmental conditions responsible for the disease.

Earlier in this discussion mention was made of providing a system of recording and following through each case of absenteeism resulting from illness or injury. It is obvious that the recording of absenteeism due to disability means little more than statistics on the subject unless something is done concerning each case. The nurse is the logical person to follow through each case of absenteeism by a visit to the home of the worker. In this way she not only obtains specific information on the cause of absence, and may often be in a position to aid in the prompt rehabilitation of the patient, but, at the same time, she is in a position to advise the family of the worker concerning other pertinent public health matters. Quite often the nurse may discover that the absence has a direct relation to the worker's occupation, and hence can initiate the needed corrective measures in the plant.

The necessity of cooperating with the local official health agency has repeatedly been stressed. The plant nurse, either as an individual or through her State and local nursing society, should utilize to the fullest extent the services which may be rendered by official and nonofficial nursing organizations, and through the official agency the services of the industrial hygiene division of that agency. It is perhaps unnecessary to urge nurses to take advantage of community resources, since nurses have been the pioneers in this regard. The other professions engaged in industrial hygiene work can learn a great deal from the nursing profession concerning the utilization and mobilization of community resources for a closely integrated industrial hygiene program.

Some of the services which may be rendered by the official industrial hygiene agency are:

1. Consultation with plant management regarding needed correction of environmental conditions.
2. Advice to the management and medical supervisor as to the relative toxicity of materials or processes, and advice concerning new materials prior to their introduction into the industry.
3. Assistance in developing, maintaining, and analyzing absenteeism records.
4. Consultant service to medical supervisors, private physicians, compensation authorities, and other State agencies regarding illness affecting workers.
5. Provision of necessary laboratory service of both a clinical and a physical nature.
6. Integration of the activities of other public health bureaus in their programs for workers, for example, the control of cancer, syphilis, and tuberculosis.

THE NURSE IN OFFICIAL AGENCIES

Although nursing services in official public health agencies are still considered far from adequate, these have been increasing rapidly in the past few years. In a recent paper on the subject of the availability of trained industrial nurses (*8*), Ruth Houlton stated that according to the United States Public Health Service Nursing Census of 1940 there were approximately 24,000 public health nurses, which is an increase of nearly 30 percent over the number of such nurses in 1930. The number of industrial nurses in this group was approximately 3,000 and apparently has remained stationary.

It is only in the last few years that official public health agencies have recognized the importance of industrial hygiene and their responsibility in this field, and have begun to provide such services to the gainfully employed. It is not surprising, therefore, that even though there has been an increase in official public health nurses, practically no consultant industrial nurses exist on the staffs of these agencies. Today, only one or two States have provided a public health nursing consultant in industrial hygiene.

The nursing consultants of the United States Public Health Service have realized this need for some time, and plans are now under way for overcoming this deficiency. There is now in the central office in Washington a consultant nurse who works with the general public health consultants but who has industrial hygiene as her special interest. This nurse works closely with the States' Relations Section of the Division of Industrial Hygiene of the National Institute of Health in the program which that Division is carrying on in the development of industrial hygiene services in State and local health departments. A concentrated course of instruction in the broader

aspects of industrial hygiene to all consultant nurses in the Service was recently given in Washington. Five of the nursing consultants are located in the Public Health Service districts and are in a position to stimulate an interest in industrial nursing in the various State nursing bureaus in their districts. In this manner it is hoped to arouse sufficient interest so that consideration will be given by each State to the appointment of a consultant nurse who has had special preparation in industrial hygiene. Such a nurse could work in close relationship with the State nursing and industrial hygiene bureaus in the promotion of industrial nursing.

One of the tasks of this State public health nurse would be to give instruction on public health methods to nurses in plants. The State nurse could stimulate the formation of an industrial nursing society, if none exists in the State, with whom she could meet frequently and discuss current industrial hygiene problems. The State nurse could also consult with the local official public health nurses and could instruct them in industrial hygiene practice. The industrial hygiene division of the State could cooperate with the State nursing consultant in industrial hygiene in presenting a course of instruction to plant nurses. It should be obvious that such a procedure will in time penetrate to local public health agencies, namely, districts, cities, and counties. For example, if there is no nurse in a plant in a community, then the public health nurse of that community is in a position to render at least consultant services to the plant. Some of the functions previously listed for the industrial nurse may be advantageously practiced by the local official nurse.

The entire field of industrial hygiene has apparently been woefully neglected by official public health workers in the past. Public health physicians, engineers, and nurses responsible for the community health program have learned the value of promoting programs among such organizations as parent-teacher associations, and similar bodies. However, they have completely overlooked the untapped source of interest and benefit which may be derived from a public health program in industry. After all, the industrial organizations in a community are the ones which contribute the greatest amount of funds, through taxation, to community enterprises, and these organizations also include many of the influential and successful citizens. It should not be difficult to convince a business man of the value and benefit to be derived from a health program, since in many instances such a program can be translated into dollars and cents. The official public health agency, by rendering adequate health service to the workers in a plant, may often interest an employer in other health measures which the local health department may be attempting to promote at the time. The nurse can do much to establish an interest on the part of industry in the local public health program through her

contacts with plant officials and workers in the course of her visits to the plant.

THE NURSE IN NONOFFICIAL AGENCIES

Ruth W. Hubbard, general director of the Visiting Nurse Society of Philadelphia, (7) has so ably presented the work of the visiting nurses in the small industrial plant that it is entirely unnecessary to discuss this subject further. As she points out, the plant which needs and wishes to pay for part-time nursing services may now properly turn to its local public health organization for such a service. There are more part-time than full-time medical services rendered in industry, while the reverse holds true with reference to nursing services, there being practically no part-time nursing services in industry. There is no reason why such services cannot be supplied by the nonofficial agency in the community. Today only a few of the nonofficial agencies are actually engaged in some form of industrial work. Nursing organizations should be encouraged in their efforts to promote such activities on the part of nonofficial nursing agencies, especially in those communities where the official nursing agency is inadequately staffed to render services in industry.

SUMMARY

An attempt has been made to define some of the problems of industrial hygiene and to indicate to what extent these are now being met, both on the part of industry and various health agencies. The objectives of industrial hygiene have also been defined and some of the activities involved for achieving these objectives have been presented. And, finally, the important role which the public health nurse plays in the entire program of maintaining employee health has been discussed from the viewpoint of the nurse in industry, in official agencies, and in nonofficial organizations.

Now more than at any other time in its history, the Nation is faced with a distinct challenge and a crying need to do everything possible to maintain at a high level the health of workers. As stated earlier, for the attainment of practical results in industrial hygiene, the combined efforts of personnel from several of the scientific professions are needed. The public health nurse has taken a very important place in the entire national health endeavor and has always fulfilled in a creditable manner every responsibility which has been assigned to her. There is no reason why the public health nurse cannot do equally well in the field of industrial hygiene; the individual nurse and the nursing organizations should be given all possible encouragement to participate in this very important phase of public health. It is only by the concerted efforts of the various professions which make up the public health movement that the desired objectives

in industrial hygiene can be achieved; and certainly the nurse can play a very active part in the attainment of these objectives.

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THE INCIDENCE OF CANCER IN NEW ORLEANS, LA., 1937[1]

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This paper continues the series of investigations into the prevalence and incidence of cancer through a survey of 10 areas in various parts of the United States (*1–4*). The findings here discussed concern the survey made in New Orleans, La.,[2] of all cases seen by doctors or hospitals in that area during the calendar year 1937 and diagnosed, either then or prior to that year, as malignant neoplasms. The criteria used in determining the cases to be included were the diagnoses of the reporting physicians, and all types of growths having inherent malignant characteristics were included. Thus sarcomas, epitheliomas, hypernephromas, and the like, were included as well as carcinomas. For a detailed outline of the procedure used in collecting these data from the individual hospitals and doctors, the reader is referred to the first paper in this series (*1*).

The population of this area was 458,762 in 1930. Reports were obtained from all but 8 of the 592 doctors of medicine in practice there in 1937. Since 48 of the 592 physicians submitted joint reports with other doctors, there were actually 536 separate reports received out of a possible 544 reports from doctors. The total number of hospitals

[1] From the Division of Public Health Methods, National Institute of Health.

[2] The data for this area were collected under the supervision of Arthur J. McDowell and Arthur Weissman. The tabulation of the data was carried out under the supervision of Miss Bess Cheney. Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Project No. 65-2-23-356. The entire survey was under the direction of Harold F. Dorn.

and clinics was 35 and reports were received from all of them. This represents 98.5 percent of all the doctors and 100 percent of the hospitals and clinics.

NUMBER OF CASES REPORTED

There were 814 deaths in New Orleans in 1937 that were attributed, on the death certificate, to cancer. This includes all death certificates on which cancer appeared as a cause of death, with or without other causes. The reports obtained covered these cases as well as any living cases seen during the year. The total number of individual cases reported in New Orleans was 3,277; about four-fifths, or 2,631 cases, were white and one-fifth, or 646 cases, were colored. Cases among females constituted nearly 56 percent of the total number. Over 61 percent of the cases were residents of New Orleans, 35 percent were nonresidents, and the rest, 124 cases, or 3.7 percent, were of unknown residence.

As in the previous studies in this series it was necessary to resort to an indirect method of determining the case rates of cancer incidence and prevalence, because it was inadvisable to apply the latest population figures then available, for the year 1930, to the study year 1937. Consequently the ratio of cases to deaths was found for the study year and this ratio was applied to the death rate for 1930. In doing this resident cases and deaths only were used, since incomplete reporting of deaths of nonresidents is to be expected. For New Orleans these ratios are 3.6 for both sexes combined, 3.3 for males, 3.8 for females, 3.9 for all white cases, and 2.6 for colored. These ratios are higher than those found in any of the cities previously surveyed except Atlanta, where the ratio for both sexes was 5.3, and the other ratios were correspondingly higher.

TABLE 1.—*Number of reported cases of cancer and recorded deaths with the ratio of total resident cases to recorded resident deaths by sex and color, New Orleans, 1937*

	Number of individual cases or deaths								
	White			Colored			Total		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Reported cases	2,631	1,262	1,369	646	188	458	3,277	1,450	1,827
Deaths from cancer [1]	599	313	286	215	84	131	814	397	417
Reported as a case	*541*	*288*	*253*	*187*	*76*	*111*	*728*	*364*	*364*
Not reported as a case	*58*	*25*	*33*	*28*	*8*	*20*	*86*	*33*	*53*
Total resident cases [2]	1,683	756	927	380	96	284	2,063	852	1,211
Resident death certificates	433	213	220	146	48	98	579	261	318
Ratio (resident cases per resident death)	3.9	3.5	4.2	2.6	2.0	2.9	3.6	3.3	3.8

[1] From the Bureau of Vital Statistics, New Orleans, La.
[2] Includes resident cases from death certificates only, as well as all reported resident cases.

Caution must be used in interpreting a ratio of cases per death as a measure of the relative prevalence of cancer. In the first place, this method takes no account of the differences that may exist in the death rates of the places compared. Thus, since New Orleans has relatively more deaths from cancer than Atlanta, the ratio of cases to deaths would be lower in New Orleans if the existing case rate were exactly the same as that in Atlanta. A second shortcoming of the ratio of cases to deaths is that it makes no allowance for the variations that may exist among the cities examined in distribution of cases by primary site of the growth. Since (as will be shown later in this paper) certain sites, such as skin, have a lower fatality rate than certain others, a city in which cancer of the skin is especially common will have more cases per death. Yet this higher ratio may indicate a higher incidence of skin cancers only, while cancer of other sites may be no more frequent than in the cities having lower ratios. Likewise, this measure does not take into account possible differences in age distribution of the populations nor does it allow for differences in the proportions of the cases that were not being treated for cancer but were kept under observation to guard against recurrences. This last factor explains at least part of the difference between the ratios for New Orleans and for Atlanta. Less than 5 percent of the reported cases in New Orleans were cases that were being kept under observation, while in Atlanta 24.5 percent were in this category. Thus the lower case-death ratio in New Orleans reflects the lesser proportion of follow-up cases among persons in whom cancer has been, at least temporarily, arrested.

The 1930 cancer death rate for New Orleans was 140.7 per 100,000 population. If the above ratio of number of cases per death is applied to this death rate it gives a case rate of about 500 per 100,000. Since the 1937 death rate was probably higher than the 1930 rate here used, it seems this is a conservative approximation of the 1937 prevalence rate, where that rate is defined as including all cases seen or treated in one year's time.

NATURE AND NUMBER OF REPORTING SOURCES

Of the 3,277 cases reported in New Orleans, 67.5 percent were reported by hospitals only, 22.4 percent by doctors only, and the remaining 10.1 percent by both doctors and hospitals. There was only one report per case for 86.1 percent of the cases. A greater proportion of the colored cases than of the white cases were reported by hospitals only, and likewise, a greater proportion of colored cases were reported by one source only. Over 95 percent of the colored cases were reported by only one source, while for whites the figure was 83.9 percent. Less than 14 percent of the colored cases were reported by private practitioners (as distinguished from hospital doctors) while over 37

percent of the white cases were so reported. The high proportion of hospital cases among the colored were largely reported either by the clinics of the hospitals or by the State supported Charity Hospital.

TABLE 2.—*Percentages of cases reported by various reporting sources, and by number of sources, by sex and color, New Orleans, 1937*

	Percent of cases								
	Both sexes		All colors		White		Colored		All cases combined
	White	Colored	Male	Female	Male	Female	Male	Female	
Nature of source:									
Doctor(s) only	25.5	9.6	23.2	21.8	25.8	25.4	5.9	11.1	22.4
Hospital(s) only	62.8	86.8	66.9	68.0	63.3	62.2	90.9	85.2	67.5
Doctor(s) and hospital(s)	11.7	3.6	9.9	10.2	10.9	12.4	3.2	3.7	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of sources:									
1 source only	83.9	95.2	86.0	86.2	84.6	83.1	95.2	95.2	86.1
2 sources only	13.7	4.3	12.0	11.7	13.2	14.3	4.3	4.4	11.9
3 or more sources	2.4	.5	2.0	2.1	2.2	2.6	.5	.4	2.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 3.—*Percentages of cases reported by reporting source, for each primary site group, with percentages of cases that were reported once only, New Orleans, 1937*

Primary site	Percent unduplicated	Percent reported by		
		Doctor(s) only	Hospital(s) only	Doctor(s) and hospital(s)
Buccal cavity	87.5	17.8	73.9	8.4
Digestive tract	85.7	20.7	68.0	11.4
Respiratory system	76.3	30.9	54.6	14.5
Genitourinary system	83.8	14.8	72.4	12.8
Breast	77.2	16.2	66.6	17.2
Skin	94.8	39.3	58.0	2.7
Brain	97.3	21.6	75.7	2.7
Bones	87.3	23.8	69.8	6.4
All others	89.7	18.0	75.9	6.2
All sites	86.1	22.4	67.5	10.1

In table 3 the data are examined for the relationships between the part of the body first affected by the malignant growth (primary site) and the nature and number of reporting sources. Among the cases most often unduplicated are those involving the skin, and these same cases are more often reported only by a doctor than are cancers of other sites. Malignant tumors of the brain are also reported by only one source more often than are other malignant tumors. Cancers of the breast and of the respiratory system, however, are seen by more than one source in a greater proportion of the cases than are cancers of other sites.

NUMBER OF CASES REPORTED PER DOCTOR OR HOSPITAL

Over one-half (56.9 percent) of the reporting sources had neither seen nor treated any cases of cancer in 1937. A large number of the doctors who had no cases were specialists in fields where malignant growths are unusual (obstetrics, psychiatry, pediatrics, etc.), while the institutions reporting no cases were mostly small sanatoria likewise devoted to specialized fields (maternity homes, for example). Nevertheless it is true that most of the general practitioners had seen relatively few cases of cancer. In New Orleans 93 percent of the doctors reported having seen not more than 5 cases each in the year 1937. This 93 percent of the doctors accounted for only about one-third (34 percent) of all the cases that were reported by doctors. Likewise 60 percent of the hospitals reported fewer than 6 cases and they contributed only 0.2 percent of the total hospital cases reported.

The bulk of the cases, therefore, were reported by only a few doctors and hospitals. Table 4 shows that over half the doctors' cases were reported by the 2.8 percent of the doctors each of whom had seen over 10 cases. For hospitals, over 99 percent of the cases were reported by 12 institutions (approximately one-third of the entire number), each of which had seen over 10 cases of cancer.

TABLE 4.—*Percentage distribution of reporting sources by number of cancer cases reported, with the corresponding percentage distribution of cases, New Orleans, 1937*

Number of cases reported by each source	All sources		Doctors		Hospitals	
	Percent of all sources reporting	Percent of all cases reported	Percent of all sources reporting	Percent of all cases reported	Percent of all sources reporting	Percent of all cases reported
No cases	56.9	0.0	57.5	0.0	48.6	0.0
1 or more cases	43.1	100.0	42.5	100.0	51.4	100.0
1 case	*15.2*	*1.9*	*15.7*	*7.4*	*8.6*	*.1*
2 to 5 cases	*18.7*	*6.9*	*19.8*	*27.0*	*2.9*	*.1*
6 to 10 cases	*4.4*	*4.2*	*4.3*	*15.3*	*5.7*	*.5*
11 to 20 cases	*1.6*	*2.9*	*1.1*	*8.0*	*8.6*	*1.2*
Over 20 cases	*3.2*	*84.1*	*1.7*	*42.3*	*25.7*	*98.1*
Total reporting	100.0	100.0	100.0	100.0	100.0	100.0

FREQUENCY OF MICROSCOPIC EXAMINATIONS TO CONFIRM DIAGNOSES

Cases which had been diagnosed as cancer by a licensed doctor of medicine were included in the survey irrespective of the method of diagnosis used. However, a column on the schedule form provided for designating those cases where the diagnosis had been confirmed by a microscopic examination of the tissue (biopsy or necropsy). In 51.7 percent of the cases there was such a test. This is significantly lower than the percentages in the cities previously surveyed, except for Atlanta where the figure was 52 percent. For Chicago, Pittsburgh, and Detroit, the percentages were 70, 62, and 78, respectively. One

reason for this is that in New Orleans, as in Atlanta, a high proportion of the cases were cancers of the skin. Fewer specimens of tissue are examined in these cases, partly because of the disfigurement that might result. The large proportion of skin cancers, however, explains only a part of the low frequency of microscopic examinations. Table 5 shows for each of several primary site groups the percentages of cases microscopically diagnosed. While such an examination was made in only 38.9 percent of the cases of cancer of the skin, for almost every site there was a lower percentage of biopsies than in the northern cities surveyed. As in cancer of the skin, there was a lower percentage of biopsies for malignant tumors primary in the brain and the digestive tract than in the other sites. This reflects the positive relationship between accessibility of the growth and probability of microscopic diagnosis, a relationship to which cancer of the skin is an exception.

TABLE 5.—*Percentage of cancer cases reported that had a microscopically confirmed diagnosis, by primary site and whether reported by a hospital, New Orleans, 1937*

Primary site	Percentage of cases microscopically diagnosed		
	All reports	Reported by doctor only	Reported by a hospital [1]
Buccal cavity	58.5	33.3	64.0
Digestive tract	33.0	23.0	35.6
Respiratory system	56.6	57.4	56.2
Genitourinary system	62.9	54.4	64.3
Breast	66.3	45.5	70.4
Skin	38.9	11.4	56.7
Brain	21.6	25.0	20.7
Bones	66.7	66.7	66.7
All other sites	51.3	34.3	55.0
All sites	51.7	31.1	57.6

[1] With or without a duplicate doctor's report.

SITE DISTRIBUTION OF REPORTED CANCER CASES

An examination of the 3,277 cases on the basis of the primary sites of the malignant lesions shows that there are sharp differences between the distributions of male and female cases, and likewise between those of white and colored cases. For this reason the percentage distributions in table 6 have been calculated separately by sex and color.

As previously stated, a very large number of the cases were primary in the skin. The percentages were 26.0 for males and 16.0 for females. These are considerably higher than the figures for Chicago, Pittsburgh, and Detroit, 12.5, 16, and 12.3 percent for males, and 6.9, 9, and 6.2 percent for females, respectively. The one other southern area already surveyed, however, had an even higher percentage of cases in the skin group. In that area, Atlanta, Ga.,

38.5 percent of the cases among males and 23.1 percent of those among females were primary in the skin. As is well known, cancer of the skin is less common among colored people. For colored cases only 4.3 percent of the cases among males and 2.6 percent of those among females were primary in this site.

Along with skin, cancer of the buccal cavity occupies a somewhat more important position among the cases in New Orleans than it did in Chicago, Pittsburgh, and Detroit, although here again there was an even higher percentage in Atlanta.

TABLE 6.—*Percentage distribution of reported cases of cancer by sex, color, and primary site, New Orleans, 1937*

Primary site	White		Colored		Total	
	Male	Female	Male	Female	Male	Female
Buccal cavity	16 2	3 6	8.5	3 7	15 2	3 6
Lip	9 2	1 2	2 1	2	8 3	.9
Tongue	2 1	6	3 7	.4	2 3	.5
Mouth	9	3	.5	2	8	.3
Jaw	.5	6	1.1	4	6	.5
Pharynx	5	.1	.5	.2	.5	2
Others	3 1	8	.5	2 2	2 8	1 2
Digestive tract	19 1	12 0	46.3	11 8	22 6	11 9
Esophagus	1 1	.2	5 3	1.1	1 7	4
Stomach, duodenum	8 0	2 8	26 1	6 1	10 3	3 6
Intestines	3 4	5 0	3 2	1 8	3 4	4 2
Rectum, anus	2 8	1 6	3 2	1.8	2 8	1.6
Liver, biliary passage	1 8	1 0	3 7	.4	2 1	.9
Pancreas	1 2	8	3 2	.4	1 4	.7
Others	.8	5	1.6	2	.9	.4
Respiratory system	9 5	1 2	7 4	4	9.2	1 0
Larynx	4 8	.2	2 1	---	4 4	.1
Lungs, pleura	4 3	7	5 3	.4	4 4	.7
Others	5	.3	---	---	.4	.2
Genitourinary	15 5	33 0	20 2	51 5	16 1	37 7
Uterus	---	25 0	---	45 9	---	30 3
Kidneys	1 5	1 6	3 7	.4	1.8	1 3
Bladder	5 6	2 2	1 1	1.1	5 0	1.9
Prostate	6 2	---	9.0	---	6 6	---
Others	2 1	4 2	6 4	4 1	2 7	4 2
Breast	.2	22 1	1 6	21 4	.4	22 0
Skin	29.2	20 4	4 3	2 6	26 0	16 0
Brain	1.2	1.5	1.1	---	1 2	1 1
Bones	2.4	1.1	1 6	3.3	2.3	1.6
All other sites	6.7	5.1	9 0	5.2	7.0	5.1
All sites	100.0	100.0	100.0	100.0	100.0	100.0

One other difference between New Orleans and the other cities surveyed appears in the distribution by site. There is a definitely greater proportion of cases primary in the respiratory system. Examination reveals that this reflects a real difference and that this difference comes primarily from a greater relative prevalence of cancer of the larynx. The percentage of cases in this group is more than twice as great for New Orleans as for any city previously surveyed. The reason for this higher prevalence is not immediately apparent.

In general, the same sex and color differences prevail in the site distribution of the cases in this area as have been noted in the earlier papers. For cases among males the order of importance of sites is skin and buccal cavity, digestive tract, genitourinary, and respiratory. For cases among females two sites, genitourinary and breast, make up over half of all cases reported, and, with skin and digestive tract, constitute over 87 percent of all cases. One other difference which has been apparent in all of the cities is the greater prevalence of respiratory cancer among males than among females. This is true

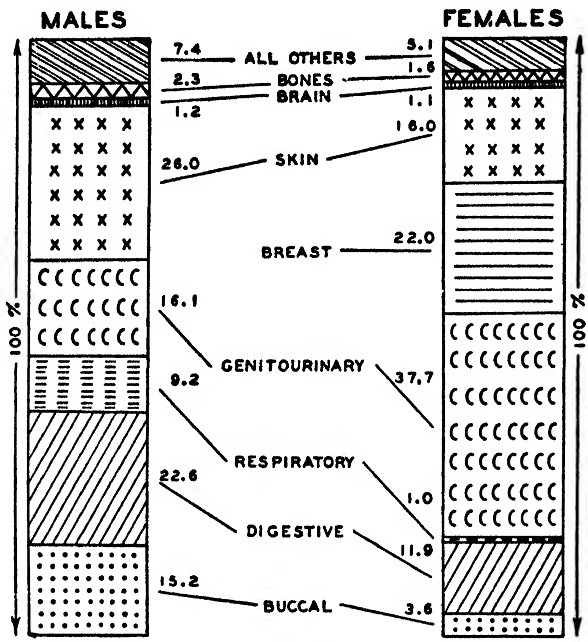

FIGURE 1.—Percentage distribution of reported cases of cancer by primary site, for males and for females, New Orleans, 1937.

of each of the specific sites in the respiratory group and is true of cancer mortality as well as of morbidity.

The site distribution of colored cases is less varied than that of white cases. Two-thirds of all cases among colored males are reported as primary in either the digestive tract or the genitourinary system. For colored females, 72.9 percent of the cases are reported as primary in either the genitourinary system (with 45 percent in one specific site, the uterus) or the breast. This concentration of cases in very few sites results partly from the fact that medical care is received by colored persons at a later stage of the disease. The resulting diagnoses of primary site may be less specific and precise because of the widespread metastases and extensions which often characterize the late stages of cancer.

AGE DISTRIBUTION OF REPORTED CANCER CASES

The percentage distribution by age of the patient of all reported cancer cases in New Orleans shows no important differences from those seen in the other cities studied. In table 7 this distribution is given separately for all cases, male, female, white, and colored. Among persons under 20 years of age there are more cases among males than females; among persons aged 20–50 a majority of the cases are among females; in the older age groups the proportions are again reversed, a larger proportion of the cases among males than among females being over 60 years of age. The immediate reason for this lies in the differences in sites most frequently involved for males and for females. This relationship of site to age is considered below.

TABLE 7.—*Percentage age distribution of all reported cases of cancer, by sex and color, New Orleans, 1937*

Age groups	Percent of cases of known age in each age group				
	All cases combined	Male	Female	White	Colored
Under 10	0.6	0.8	0.5	0.5	0.9
10–19	1.0	1.1	.9	.8	1.6
20–29	3.7	2.7	4.4	2.7	7.2
30–39	10.6	7.7	12.9	10.1	12.4
40–49	20.2	16.5	23.2	19.1	24.5
50–59	24.7	24.7	24.7	24.4	25.7
60–69	24.5	27.8	21.9	26.1	19.0
70–79	11.9	15.1	9.5	13.3	7.1
80 and over	2.7	3.6	2.0	3.0	1.6
All cases of known age	100	100	100	100	100

The age distribution of colored cases differs from that of white cases chiefly in that higher percentages of the colored cases are found in every group below 50, while in every age group above 60 there is a higher percentage of cases among white persons. This may be only a function of the age composition of the white and colored populations involved.

Between the ages of 40 and 69 are found 69.4 percent of all the cancer cases reported. Sixteen percent of the cases were among persons under 40, and 14.6 percent among persons over 70. This differs slightly from the percentage distributions in some of the other cities in that here a proportionately larger number of cases are in the younger age groups.

AGE AND PRIMARY SITE RELATIONSHIPS

In tables 8 (males) and 9 (females) the distribution of the cases is shown by age and primary site groups. The same relationships that have been noted in the earlier studies appear here. In two sites, brain and bones, there is an unusually high percentage of cases in the

younger age groups. On the other hand, cancer of the prostate and cancer of the skin are found most frequently in older persons. Cancer

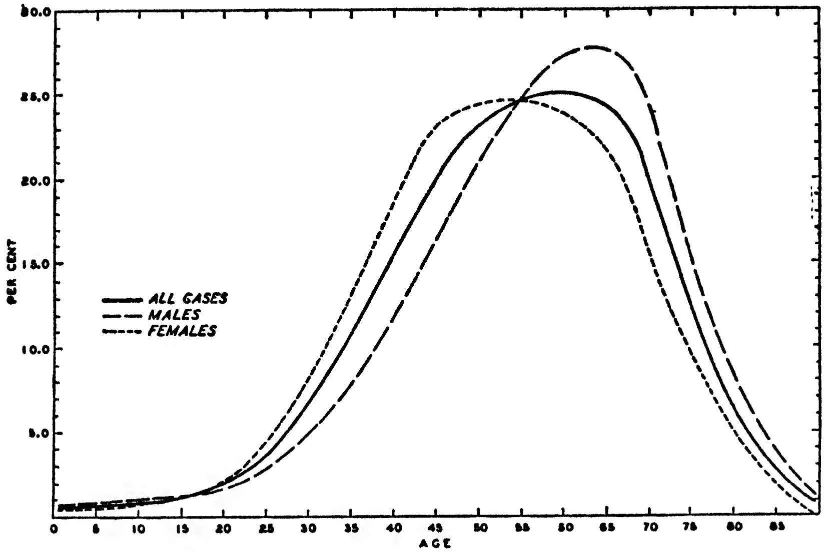

FIGURE 2.—Percentage age distribution of all reported cases of cancer by sex, New Orleans, 1937.

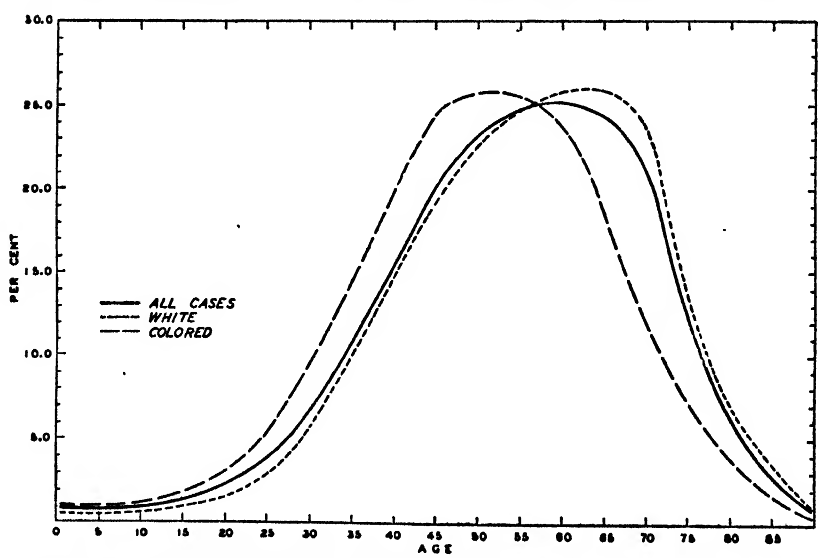

FIGURE 3.—Percentage age distribution of all reported cases of cancer by color, New Orleans, 1937.

of the respiratory system is most prevalent in the age groups from 35 to 65, 71.8 percent of the male and 71.5 percent of the female respiratory cases being found in these age groups.

Table 8.—*Percentage distribution of reported cases of cancer by age for each site of malignant growth, males only, New Orleans, 1937*

Primary site	Percentage in each age group									Number of cases
	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	All known ages	
Buccal cavity	0.5	0.5	5.9	14.8	21.2	35.0	15.2	6.9	100.0	203
Lip	----	*.9*	*5.4*	*21.8*	*27.3*	*27.3*	*10.9*	*6.4*	*100.0*	*110*
Others	*1.1*	----	*6.5*	*6.5*	*13.9*	*44.1*	*20.4*	*7.5*	*100.0*	*93*
Digestive tract	.6	1.0	5.1	11.6	18.7	32.8	23.8	6.4	100.0	311
Stomach	----	----	*3.6*	*9.4*	*20.3*	*33.3*	*27.6*	*5.8*	*100.0*	*138*
Intestines	----	----	*8.3*	*12.5*	*16.7*	*27.1*	*22.9*	*12.5*	*100.0*	*48*
Rectum	----	*2.5*	*10.0*	*22.5*	*17.5*	*32.5*	*5.0*	*10.0*	*100.0*	*40*
Others	*2.4*	*2.4*	*3.5*	*9.4*	*17.6*	*35.3*	*27.0*	*2.4*	*100.0*	*85*
Respiratory system	.8	1.6	2.4	13.7	23.4	34.7	20.2	3.2	100.0	124
Lungs	*1.6*	*1.6*	*4.7*	*20.6*	*17.5*	*39.7*	*12.7*	*1.6*	*100.0*	*63*
Others	----	*1.6*	----	*6.6*	*29.5*	*29.5*	*27.9*	*4.9*	*100.0*	*61*
Genitourinary system	1.4	.9	4.6	5.5	16.0	29.2	30.6	11.8	100.0	219
Prostate			-	- -	*3.4*	*26.1*	*51.2*	*19.3*	*100.0*	*88*
Others	*2.3*	*1.5*	*7.6*	*9.2*	*24.4*	*31.3*	*16.8*	*6.9*	*100.0*	*131*
Skin	----	.7	4.8	9.5	19.0	25.5	24.2	16.3	100.0	294
Brain	----	13.3	13.3	26.7	13.3	33.4	----	----	100.0	15
Bones	3.6	17.9	3.6	10.7	32.1	21.4	10.7	--	100.0	28
All others	3.3	7.6	9.8	10.9	20.7	21.7	18.4	7.6	100.0	92
All sites	.9	1.9	5.2	10.9	19.5	30.0	22.4	9.2	100.0	1,286

Table 9.—*Percentage distribution of reported cases of cancer by age, for each site of malignant growth, females only, New Orleans, 1937*

Primary site	Percentage in each age group									Number of cases
	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	All known ages	
Buccal cavity	3.6	3.6	7.1	19.6	23.2	17.9	17.9	7.1	100.0	56
Digestive tract	.5	1.5	3.9	16.5	18.0	25.2	24.7	9.7	100.0	206
Stomach	----	----	*4.8*	*22.6*	*11.3*	*17.7*	*33.9*	*9.7*	*100.0*	*62*
Intestines	*1.4*	*2.8*	*4.2*	*11.3*	*19.7*	*31.0*	*19.7*	*9.9*	*100.0*	*71*
Rectum	----	*3.5*	*6.9*	*17.2*	*27.6*	*13.8*	*24.1*	*6.9*	*100.0*	*29*
Others	----	----	----	*15.9*	*18.2*	*34.1*	*20.4*	*11.4*	*100.0*	*44*
Respiratory system	----	7.1	7.1	21.4	21.5	28.6	14.3	----	100.0	14
Genitourinary system	.5	.6	9.8	21.0	28.7	24.1	12.3	3.0	100.0	665
Uterus	----	*.7*	*10.6*	*22.1*	*29.0*	*25.5*	*11.0*	*1.1*	*100.0*	*538*
Others	*2.4*	----	*6.3*	*16.5*	*27.6*	*18.1*	*18.1*	*11.0*	*100.0*	*127*
Breast	----	1.1	4.4	22.3	26.2	26.2	15.1	4.7	100.0	363
Skin	----	1.4	7.3	11.9	16.9	25.1	25.1	12.3	100.0	219
Brain	11.1	11.1	27.8	27.8	16.7	5.5	----	----	100.0	18
Bones	3.5	13.8	17.2	17.2	20.7	3.5	24.1	----	100.0	29
All others	6.3	7.6	13.9	15.2	17.7	25.3	8.9	5.1	100.0	79
All sites	.9	1.8	7.9	19.2	24.2	24.1	16.3	5.6	100.0	1,649

Another way of viewing this interrelationship of site and age is to consider the relative importance of the various sites at each age group. This shows what part of the body is most likely to be affected by cancer at any particular age (see figs. 4 and 5).

RELATIVE FATALITY OF DIFFERENT PRIMARY SITES OF CANCER

As is well known, there are sharp differences in the fatality of malignant growths, depending upon the part of the body that is

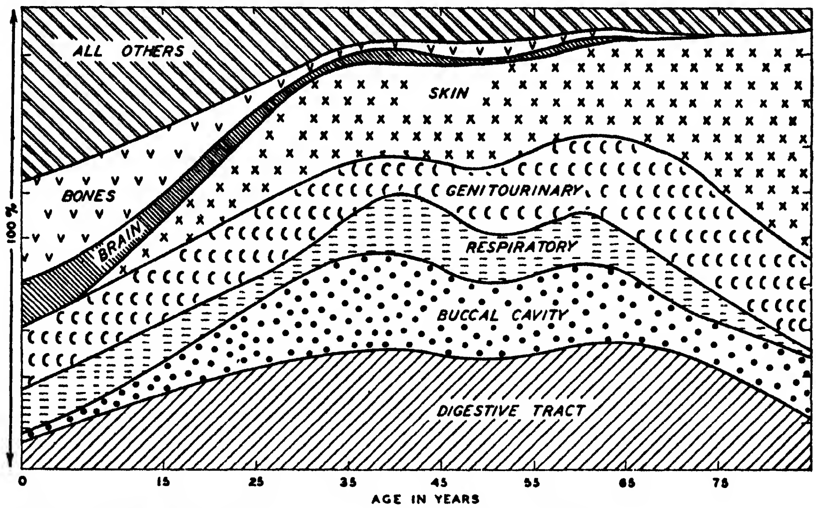

FIGURE 4.—Percentage distribution of reported cases of cancer for each age group by primary site, male cases only, New Orleans, 1937.

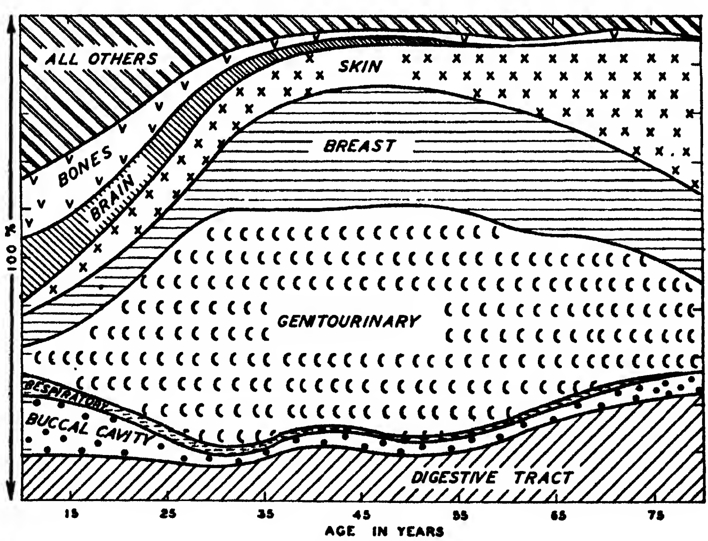

FIGURE 5.—Percentage distribution of reported cases of cancer for each age group by primary site, female cases only, New Orleans, 1937.

involved. In table 10 these differences are shown by the percentage distributions among the sites of both deaths and cases collected in the survey. If cancer of a particular site is relatively more fatal than the average, then it will constitute a greater proportion of the

deaths than of the cases; conversely, if less fatal it will constitute a smaller proportion of the deaths than of the cases. Thus, skin is a site with relatively low fatality: For males, 26 percent of the cases were primary in this site, compared with only 4 percent of the deaths; for females, 16 percent of the cases were in this site, and 2.4 percent of the deaths. On the other hand, cases primary in sites in the respiratory system and digestive tract make up a larger part of the deaths than of the cases, indicating that they are more fatal than the average. Malignant growths that are primary in the male genitourinary and female urinary systems are likewise more fatal, while cancers of the female breast and uterus are somewhat less fatal than those primary in other sites.

TABLE 10.—*Percentage distribution of all cancer deaths*[1] *and of all cancer cases reported by sex, color, and primary site, New Orleans, 1937*

	White				Total			
	Male		Female		Male		Female	
	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases
Buccal cavity, pharynx	12.5	15.4	2.4	3.3	10.4	14.5	2.5	3.1
Lip	1.8	9.2	—	1.2	1.4	8.3	—	.9
Tongue	5.0	2.1	1.2	.6	4.2	2.3	.8	5
Mouth	.7	.9	—	.3	.6	.8	.3	.3
Jaw	1.4	.5	.4	.6	1.1	.6	.3	.5
Pharynx	1.1	.5	—	.1	1.1	.5	.3	.2
Others	2.5	2.2	.8	.5	2.0	2.0	.8	7
Digestive tract	37.4	19.1	35.8	12.0	42.7	22.6	33.3	11.9
Esophagus	.7	1.1	8	2	1.7	1.6	.8	.4
Stomach, duodenum	16.0	8.0	8.9	2.8	19.8	10.3	11.6	3.6
Intestines	7.8	3.4	11.7	5.1	7.1	3.4	8.9	4.2
Rectum, anus	3.2	2.8	4.4	1.6	3.4	2.8	4.6	1.7
Liver, biliary passage	5.4	1.8	5.2	1.0	5.9	2.1	4.1	.9
Pancreas	3.2	1.2	3.2	.8	3.7	1.5	2.2	.7
Others	1.1	.8	1.6	.5	1.1	.9	1.1	.4
Respiratory system	16.0	9.5	2.4	1.2	15.2	9.2	1.6	1.0
Larynx	4.6	4.8	—	.1	4.5	4.4	—	.1
Lungs, pleura	7.8	3.0	2.4	.7	7.6	3.1	1.6	.6
Others	3.6	1.7	—	.4	3.1	1.7	—	.3
Genitourinary system	21.0	15.5	30.1	32.8	19.8	16.1	33.3	37.5
Uterus	—	—	16.5	25.1	—	—	21.9	30.3
Kidneys	4.7	1.5	3.6	1.6	4.5	1.8	2.7	1.3
Bladder	7.8	5.6	5.2	2.2	6.5	5.0	3.8	1.9
Prostate	7.8	6.2	—	—	7.7	6.6	—	—
Others	.7	2.2	4.8	3.9	1.1	2.7	4.9	4.0
Breast	—	.2	17.7	22.1	—	.4	16.8	22.0
Skin	4.6	29.2	3.6	20.4	4.0	26.0	2.4	16.0
Brain	.3	1.2	.4	1.5	.3	1.2	.3	1.1
Bones	1.8	2.4	1.2	1.1	1.4	2.3	1.1	1.6
All others	6.4	7.5	6.4	5.6	6.2	7.7	8.7	5.8
All sites	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Deaths obtained from death certificate only (i. e., with no corresponding case report) are included here.

DURATION OF CASE SINCE FIRST DIAGNOSIS

The schedule form used in reporting the cases provided for the recording of the date on which the case was first seen with cancer. The time

from this date to January 1, 1938, the end of the study year, for living cases, or to the date of death for dead cases, was considered to be the duration of the case. These durations were calculated for all cases reported and the results are listed in tables 11 and 12.

Three-fourths of all the cases (76.2 percent) had a duration of less than 1 year. Nearly half (47.7 percent) were first seen less than 6 months prior to the end of the study year. The cases that died during the year had a markedly shorter duration; 70.6 percent had a duration of less than 6 months, and 83.4 percent under 1 year. The percentage of white cases with a year or more duration is slightly higher than that of colored cases. Only 3.1 percent of the cases had been seen at least 5 years prior to the end of the study year; only 1.1 percent had been seen at least 8 years before that date. These durations for the cases in New Orleans are considerably shorter than those for the cases in the cities previously surveyed. This is probably an indication of less complete follow-up of cases successfully treated as well as later diagnosis.

TABLE 11.—*Percentage distribution of cases of cancer by months since first diagnosis, by color and vital status, New Orleans, 1937*

Months since first seen	Percentage of cases in each duration group						
	All cases	All white	All colored	Alive		Dead	
				White	Colored	White	Colored
Under 6	47.7	47.0	50.7	41.7	39.1	67.6	79.1
6-11	28.5	28.7	27.9	32.7	34.7	13.4	11.2
12-23	11.5	11.7	11.0	11.9	12.9	10.6	6.4
24-35	4.7	4.8	4.3	5.1	5.7	3.5	1.1
36-47	2.7	2.8	2.3	3.0	2.8	2.0	1.1
48-59	1.8	1.7	1.9	1.9	2.6	1.1	----------
60-71	1.1	1.1	1.1	1.1	1.3	.8	.6
72-83	.6	.7	.3	.7	.2	.4	.5
84-95	3	.8	----------	.3	----------	.2	----------
96 and over	1.1	1.2	.5	1.5	.7	.4	----------
All known durations	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of cases (known duration)	3,264	2,619	645	2,082	458	537	187

The duration of cases by primary site of the malignant growth is shown in table 12. The percentage of the cases in each duration group is shown separately for living and dead, for each of the broad site groups. Some differences are noted, similar to those seen in the earlier table comparing the fatality of various sites. Cancers of the digestive tract, respiratory system, brain, and bones tend to have especially short durations, while those of the skin, breast, buccal cavity, and genitourinary system have relatively longer recorded durations since first diagnosis. These differences are true of both the living and dead classifications. The latter group, of course, has a much shorter duration than the former.

TABLE 12.—*Percentage distribution of cancer cases by months since first diagnosis, primary site, and vital status at end of survey, New Orleans, 1937*

Primary site	Percentage of cases in each duration (months since first seen) group												Number of cases
	Under 6	6–11	12–17	18–23	24–29	30–35	36–41	42–47	48–53	54–59	60 and over	Total	
Buccal cavity:													
Living	35.3	32.4	10.4	2.9	5.8	2.9	1.6	2.9	2.1	0.8	2 9	100 0	241
Dead	56.5	19.6	-----	4.4	4.4	4.3	------	2.2	4 3	--- --	4 3	100.0	46
Digestive tract:													
Living	44 3	44 0	5.2	1.4	2.1	.7	------	.3	.3	.3	1 4	100 0	291
Dead	84 5	7.5	4.0	1.6	.4	.4	------	.8	------	.4	.4	100 0	252
Respiratory system:													
Living	44.3	33.0	9.2	4.1	2.1	3.1	2.1	------	------	------	2.1	100 0	97
Dead	77.8	14.8	3.7	------	1.8	------	1.9	------	------	------	------	100.0	54
Genitourinary system:													
Living	41 1	35 6	6.9	4 9	3 1	1 3	.4	1 4	1.7	1 0	2.6	100 0	710
Dead	67.3	13.9	10 6	2.9	1.4	1.4	1.0	------	-----	-----	1 5	100 0	208
Breast.													
Living	30.6	31 9	9.9	7 8	5.1	3 6	4.8	1 2	1.2	9	3.0	100 0	333
Dead	43.2	18 9	10.8	1 4	5 4	5 4	2 7	4 0	------	1.4	6.8	100 0	74
Skin:													
Living	44 6	26 8	7 3	3 8	3 0	2.4	2 5	1.4	1 9	.3	6 0	100 0	632
Dead	48 4	9 7	19 3	9 7	------	--	6.5	------	6 4	------	------	100 0	31
Brain [1]	46 0	45 9	5 4	------	------	2.7	------	------	------	------	------	100 0	37
Bones [1]	46 0	23 8	15 9	4 7	------	------	3 2	------	1.6	1 6	3.2	100 0	63
All others:													
Living	52.2	29.0	10 7	.6	1.9	.6	------	1 3	.6	.6	2 5	100 0	159
Dead	75 0	16.7	5 5	2 8	------	------	------	------	------	------	------	100 0	36
All sites													
Living	41 2	33 0	8 0	4 1	3 3	2 0	1 7	1.3	1 4	.7	3 3	100 0	2,540
Dead	70.6	12.8	7 2	2.3	1.5	1 4	1 0	.8	.6	.3	1 5	100 0	724

[1] Too few cases to separate by vital status.

CASES UNDER OBSERVATION ONLY

The preceding discussion has concerned itself with all cancer cases reported. However, there are certain groups that merit special consideration. One such group consists of the cases which had received their last treatment for cancer prior to the survey year (1937) but which had been seen in that year for check-up subsequent to the last treatment. These cases constitute that part of the "cured" cases which are kept under observation to guard against recurrence. This group is here called the group "under observation only."

Only 4.3 percent of all cases reported in New Orleans were under observation only. This is considerably lower than the percentages that were under observation in the other cities surveyed. In Detroit 20.5 percent of the cases were in this group, in Atlanta 24.5 percent, in Pittsburgh 15.0 percent, and in Chicago 8.4 percent. When the cases under observation only are examined by reporting source it is found that this unusually low figure for New Orleans results from the very few cases under observation reported by the hospitals. There were 11.7 percent of the doctors' cases in the group under observation only, while only 2.5 percent of the hospital cases were in this group. There is also a marked difference between the percentages of white and colored cases in this group. The figure for colored is 1.9 percent as

compared with 4.9 percent for white. Apparently very few of the colored cases are observed subsequent to successful treatment.

TABLE 13.—*Percentages that cases under observation only are of all cases of cancer reported, by sex, color, and reporting source, New Orleans, 1937*

Class of case	Percentage of all cases					Percentage reported by—		
	Male	Female	White	Colored	Total	Doctor(s) only	Hospital(s) only	Doctor(s) and hospital(s)
Under observation only	4.4	4.2	4.9	1.9	4 3	11.7	2.5	
Treated in 1937	95.6	95.8	95.1	98.1	95 7	88.3	97.5	100.0
All cases	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The number of these cases, 141, is too small to permit detailed break-downs by age and site. The actual numbers have been listed in the appendix, but no percentage distributions have been computed except for the distribution of the cases by site. In table 14 this distribution is compared with that of treated cases. The differences stand out clearly. The cases under observation only are concentrated in three groups—skin, breast, and genitourinary system. These three groups include over 78 percent of all the cases under observation only. The breast and genitourinary cases are nearly all among females, while most of the skin cases are in males.

TABLE 14.—*Percentage site distribution of cancer cases under observation only during the study year and of cases treated, New Orleans, 1937*

Primary site	Percentage in each site group: Cases under observation only	Percentage in each site group: Treated cases	Primary site	Percentage in each site group: Cases under observation only	Percentage in each site group: Treated cases
Buccal cavity	9.9	8 7	Brain	.7	1.2
Digestive tract	4 3	17 2	Bones	1 4	1 9
Respiratory system [1]		4 8	All others	5.7	6.0
Genitourinary system	14 2	28 7	All sites	100.0	100.0
Breast	15.6	12.3			
Skin	48.2	19.2			

[1] There were no cases of respiratory cancer in the group under observation only.

In appendix tables 13, 14, and 15, the cases under observation only are listed by months since cessation of treatment. This time is calculated up to January 1, 1937, the beginning of the study year. Thus, if the cases were still alive at the end of the study year (a year during which they had no treatment), the duration was 1 year longer than listed here for each of the cases. Considering the duration up to the beginning of the study year only, there were 59 cases with a duration of over 1 year without treatment prior to that date. There were 12 cases with over 5 years duration without treatment, and 6 cases with a duration of over 8 years.

CANCER CASES FIRST SEEN IN 1937

The strict meaning of incidence of a disease refers to the number of persons "coming down with" the disease in a given period of time. In a consideration of this problem it is necessary to exclude those cases which originated prior to the period of time under consideration. In table 15, only the cancer cases that originated in 1937 (that is to say, were first diagnosed in 1937) are considered. There were 2,349 such cases, 1,062 in males and 1,287 in females. Just as a ratio of all

TABLE 15.—*Number of cancer cases first seen in 1937, by sex, color, vital status, and residence, New Orleans*

Vital status (as of Jan. 1, 1938)	Number of cases first seen in 1937									
	White				Colored				Total	
	Resident		Nonresident		Resident		Nonresident			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Alive	268	397	191	185	32	96	25	44	516	722
Dead	141	128	67	30	35	63	29	20	272	241
Death certificate located	*134*	*118*	*60*	*27*	*34*	*59*	*26*	*20*	*254*	*224*
Death certificate not located	*7*	*10*	*7*	*3*	*1*	*4*	*3*	*0*	*18*	*17*
Unknown	136	147	104	82	11	56	23	39	274	324
Total reported	545	672	362	297	78	215	77	103	1,062	1,287
Cases from death certificate only	25	33			8	20			33	53
Total new cases among residents[1]	570	705			86	235			656	940
Total death certificates of residents[2]	213	220			48	98			261	318
Ratio of resident cases to deaths	2.7	3.2			1.8	2.4			2.5	3.0

[1] Includes cases from death certificate only.
[2] Irrespective of whether the case was first seen in 1937.

resident cases to deaths was computed earlier in this paper, a similar ratio can be calculated for these cases. This ratio, using resident cases first seen in 1937, and all resident deaths, is 2.8 for all cases, 2.5 for males and 3.0 for females. The 1930 cancer death rate used in conjunction with this ratio yields an approximate case incidence rate of 394 per 100,000. Since this is based on the 1930 death rate and since the cancer death rate has been increasing almost everywhere, it seems that this is a conservative estimate and that, therefore, about 400 new cases of cancer for every 100,000 of the population are seen in this area every year. This is considerably higher than the similar rates for the northern areas surveyed. In Detroit, for example, the incidence rate was estimated to be at least 126 per 100,000. The sharp difference in these rates, just as in the prevalence rates discussed earlier, arises, at least in part, from the large number of skin cancers which constitute 23 percent of all the cancer cases among males and

16 percent of all the cases among females first seen in 1937 in New Orleans.

Earlier in this paper the prevalence rate of all cases of cancer, observed or treated, was found to be somewhat lower in New Orleans than the rate established for Atlanta, Ga. It was suggested that this difference arose, at least in part, from the less complete follow-up of cancer cases subsequent to successful treatment in New Orleans as compared to Atlanta. The ratios of cases first seen in 1937 to all deaths, for residents only, bear out this conclusion. This ratio for Atlanta is 2.7, slightly lower than the New Orleans ratio (2.8), and so, since the death rate is higher in New Orleans, the incidence rate of cancer is likewise higher than in Atlanta, as well as higher than in any of the northern cities surveyed.

In general the site distribution of the cases first seen in 1937 resembles that of all cases reported. Among the cases first seen in 1937, there is a larger proportion in sites with relatively high fatality rates. For example, cancer of the digestive tract constitutes 22.6 percent of all cases reported among males, but it makes up 26.5 percent of all such cases first seen in 1937. Conversely, cases in sites such as skin, breast, and genitourinary system, which have a lower fatality and a longer duration, make up a smaller proportion of the cases first seen in 1937 than they do of all cases combined. The age distribution of the cases first diagnosed in 1937 is not significantly different from that of all cases combined.

TABLE 16.—*Percentage distribution of cancer cases first seen in 1937, by primary site and sex, New Orleans*

Primary site	Percentage of cases in each site group		Primary site	Percentage of cases in each site group	
	Male	Female		Male	Female
Buccal cavity	13.2	3.3	Brain	1.5	1.3
Digestive tract	26.5	13.6	Bones	2.3	1.5
Respiratory system	9.4	1.2	All others	7.4	5.7
Genitourinary system	15.9	39.4			
Breast	.5	18.2	All sites	100.0	100.0
Skin	23.3	15.8			

TABLE 17.—*Percentage distribution of cancer cases first seen in 1937, by age and sex, New Orleans*

Age	Percentage of cases in each age group		Age	Percentage of cases in each age group	
	Male	Female		Male	Female
Under 15	0.9	0.9	55–64	29.9	22.7
15–24	2.4	2.0	65–74	22.3	15.7
25–34	5.3	9.5	75 and over	8.2	5.7
35–44	11.1	19.9			
45–54	19.9	23.6	All known ages	100.0	100.0

SUMMARY

The fifth area studied in a survey of the incidence and prevalence of cancer, New Orleans, La., yielded 3,277 individual cases of malignant neoplasms seen by doctors or hospitals in that area in the year 1937. There were 814 deaths from cancer in that year in New Orleans. The ratio of resident cases to resident deaths is 3.6 for all cases, 3.3 for males and 3.8 for females. On the basis of the 1930 cancer death rate this would represent a prevalence rate of about 500 per 100,000 population. This is considerably higher than the rates for Chicago, Pittsburgh, or Detroit, and somewhat higher than the rate in Atlanta.

Over two-thirds of all the cases in New Orleans were reported by hospitals only. There was only one report on 86 percent of all cases. Proportionately fewer colored than white cases were reported by doctors rather than by hospital clinics. Over half, 57.5 percent, of the doctors reported having seen no case of cancer in 1937. The 2.8 percent of the doctors who had over 10 cases each reported over 50 percent of all the doctors' cases. The one-third of the hospitals, each of which reported over 10 cases, accounted for 98 percent of all the hospital cases reported.

A microscopic examination of tissue was used to confirm the diagnosis in only 51.7 percent of the cases. This is a considerably smaller proportion of microscopic tests than in any of the northern cities surveyed.

New Orleans, like Atlanta, had a large percentage of cases of cancer primary in the skin. There were 29.2 percent of cases among white males, and 20.4 percent among white females in this group. This is very much higher than the percentages for Chicago, Detroit, and Pittsburgh. Another site more common in New Orleans than in the cities previously surveyed is the larynx. The most important sites for male cases are skin and buccal cavity, digestive tract, genitourinary system, and respiratory system. For females, two sites, genitourinary and breast, make up over half of the cases, and with skin and digestive tract constitute 87 percent of all cases. The sites of cancer among colored persons fall chiefly into a few of the site groups, three sites, genitourinary, breast, and digestive tract, accounting for over two-thirds of all cases.

The age distribution of the cancer cases reported in New Orleans is similar to that of the other cities surveyed. About 39 percent of all the cases are among persons over 60 years of age. Over 5 percent of the persons with cancer were under 30 years of age. There is a larger percentage of cases in the age groups from 20 to 50 among females than among males. The colored cases tend to be younger than the white cases.

There are marked differences in the age distributions by site of the cancer. Cancer of the skin becomes increasingly more important as age increases. Bones, brain, and "all other sites," however, are important sites of malignant growths only at relatively young ages. The pattern of distribution by age and site is substantially the same as has been observed in the earlier studies.

The durations of the cases in New Orleans were somewhat shorter than those found in the other cities surveyed. Nearly half, 47.7 percent, of the cases had been first seen less than 6 months prior to the end of the study year. The longest durations occur in those site groups which have the lowest fatality—skin, breast, and female genital system.

More than 95 percent of the cases reported in this area had received some treatment for cancer in the study year. The proportion of cases that were under observation only was 4.3 percent, lower than in any of the earlier studies. This resulted largely from the low percentage of cases under observation reported by hospitals. Of the cases reported by hospitals, less than 3 percent were under observation.

There were 2,349 cases of cancer in New Orleans that were first seen in 1937. This represents a ratio of cases to deaths of 2.8. Using the 1930 cancer death rate as a basis this would indicate an incidence rate of cancer of 394 per 100,000. This is significantly higher than the rates estimated for any of the areas previously surveyed.

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Appendix

The tables listed here contain the actual figures on which the tables of the paper proper are based. They are numbered to correspond with the related tables in the text.

Table 2.—*Number of cases of cancer reported by various sources and by number of sources, by sex and color, New Orleans, 1937*

Reported by	Actual number of cases								
	Both sexes by color		All colors by sex		White		Colored		All cases combined
	White	Colored	Male	Female	Male	Female	Male	Female	
Nature of source									
Doctor(s) only	672	62	336	398	325	347	11	51	734
Hospital(s) only	1,651	561	970	1,242	799	852	171	390	2,212
Doctor(s) and hospital(s)	308	23	144	187	138	170	6	17	331
All sources	2,631	646	1,450	1,827	1,262	1,369	188	458	3,277
Number of sources									
1 source only	2,206	615	1,247	1,574	1,068	1,138	179	436	2,821
2 sources only	361	28	174	215	166	195	8	20	389
3 or more sources	64	3	29	38	28	36	1	2	67
All sources	2,631	646	1,450	1,827	1,262	1,369	188	458	3,277

Table 3.—*Number of reported cases of cancer by primary site and reporting agency, with numbers of unduplicated cases reported, New Orleans, 1937*

Primary site	Reported by doctor only		Reported by hospital only		Reported by doctor and hospital	All reports	
	Total cases	Unduplicated cases	Total cases	Unduplicated cases	Total cases	Total cases	Unduplicated cases
Buccal cavity	51	48	212	203	24	287	251
Digestive tract	113	108	371	360	62	546	468
Respiratory system	47	36	83	80	22	152	116
Genitourinary system	136	125	667	647	118	921	772
Breast	66	60	271	254	70	407	314
Skin	263	258	388	376	18	669	634
Brain	8	8	28	28	1	37	36
Bones	15	13	44	42	4	63	55
All others	35	35	148	140	12	195	175
All sites	734	691	2,212	2,130	331	3,277	2,821

TABLE 4.—*Number of sources reporting specified numbers of cancer cases, by source reporting, with actual number of cases [1] so reported, New Orleans, 1937*

Number of cases reported by each source	Doctors		Hospitals		All sources	
	Number of sources reporting	Actual number of cases reported	Number of sources reporting	Actual number of cases reported	Number of sources reporting	Actual number of cases reported
No case	308	0	17	0	325	0
1 case	84	84	3	3	87	87
2 cases	53	106			53	106
3 cases	27	81	1	3	28	84
4 cases	11	44			11	44
5 cases	15	75			15	75
5 or less cases	*190*	*390*	*4*	*6*	*194*	*396*
6 to 10 cases	23	173	2	16	25	189
10 or less cases	*213*	*563*	*6*	*22*	*219*	*585*
11 to 20 cases	6	91	3	41	9	132
Over 20 cases	9	480	9	3, 315	18	3, 795
Any number of cases	228	1, 134	18	3. 378	246	4, 512
Total reporting	536	1, 134	35	3, 378	571	[1] 4, 512

[1] All cases reported are listed here, including duplicate reportings of the same case. All duplications were later eliminated.

TABLE 5.—*Number of cancer cases reported, and number with diagnoses microscopically confirmed, by primary site and reporting source, New Orleans, 1937*

Primary site	Number of cases reported					
	By doctors only		By a hospital [1]		By all sources	
	Total	With microscopic diagnosis	Total	With microscopic diagnosis	Total	With microscopic diagnosis
Buccal cavity	51	17	236	151	287	168
Digestive tract	113	26	433	154	546	180
Respiratory system	47	27	105	59	152	86
Genitourinary system	136	74	785	505	921	579
Breast	66	30	341	240	407	270
Skin	263	30	406	230	669	260
Brain	8	2	29	6	37	8
Bones	15	10	48	32	63	42
All other sites	35	12	160	88	195	100
All sites	734	228	2, 543	1, 465	3, 277	1, 693

[1] With or without a duplicate report from a doctor.

TABLE 6.—*Number of reported cases of cancer, by sex, color, and primary site, New Orleans, 1937*

Primary site	White		Colored		Total	
	Male	Female	Male	Female	Male	Female
Buccal cavity	205	49	16	17	221	66
Lip	*116*	*16*	*4*	*1*	*120*	*17*
Tongue	*26*	*8*	*7*	*2*	*33*	*10*
Mouth	*11*	*4*	*1*	*1*	*12*	*5*
Jaw	*7*	*8*	*2*	*2*	*9*	*10*
Pharynx	*6*	*2*	*1*	*1*	*7*	*3*
Others	*39*	*11*	*1*	*10*	*40*	*21*
Digestive tract	241	164	87	54	328	218
Esophagus	*14*	*3*	*10*	*5*	*24*	*8*
Stomach, duodenum	*101*	*38*	*49*	*28*	*150*	*66*
Intestines	*43*	*69*	*6*	*8*	*49*	*77*
Rectum, anus	*35*	*22*	*6*	*8*	*41*	*30*
Liver, biliary passage	*23*	*14*	*7*	*2*	*30*	*16*
Pancreas	*15*	*11*	*6*	*2*	*21*	*13*
Others	*10*	*7*	*3*	*1*	*13*	*8*
Respiratory system	120	16	14	2	134	18
Larynx	*60*	*2*	*4*		*64*	*2*
Lungs, pleura	*54*	*10*	*10*	*2*	*64*	*12*
Others	*6*	*4*			*6*	*4*
Genitourinary	195	452	38	236	233	688
Uterus		*343*		*210*		*553*
Kidneys	*19*	*22*	*7*	*2*	*26*	*24*
Bladder	*71*	*30*	*2*	*5*	*73*	*35*
Prostate	*78*		*17*		*95*	
Others	*27*	*57*	*12*	*19*	*39*	*76*
Breast	3	303	3	98	6	401
Skin	369	280	8	12	377	292
Brain	15	20	2		17	20
Bones	30	15	3	15	33	30
All other sites	84	70	17	24	101	94
All sites	1,262	1,369	188	458	1,450	1,827

TABLE 7.—*Number of reported cases of cancer by age of patient, by sex, and by color, New Orleans, 1937*

Age group	Number of cases				
	Male	Female	White	Colored	All cases combined
Under 5	5	5	6	4	10
5–9	5	3	6	2	8
10–14	1	6	6	1	7
15–19	13	9	13	9	22
20–24	11	20	19	12	31
25–29	24	52	42	34	76
30–34	43	79	84	38	122
35–39	56	134	149	41	190
40–44	84	183	189	78	267
45–49	128	199	249	78	327
50–54	123	200	247	76	323
55–59	195	208	315	88	403
60–64	191	190	318	63	381
65–69	167	172	281	58	339
70–74	121	97	183	35	218
75–79	73	59	122	10	132
80–84	29	25	47	7	54
85–89	15	6	19	2	21
90–94		1	1		1
95–99	2		1	1	2
100 and over		1	1		1
Unknown	164	178	333	9	342
All ages	1,450	1,827	2,631	646	3,277

TABLE 8.—*Number of cancer cases reported by primary site and age group, males only, New Orleans, 1937*

Primary site	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	Unknown	All ages
Buccal cavity	1	1	12	30	43	71	31	14	18	221
Lip	*0*	*1*	*6*	*24*	*30*	*30*	*12*	*7*	*10*	*120*
Others	*1*	*0*	*6*	*6*	*13*	*41*	*19*	*7*	*8*	*101*
Digestive tract	2	3	16	36	58	102	74	20	17	328
Stomach	*0*	*0*	*5*	*13*	*28*	*46*	*38*	*8*	*12*	*150*
Intestines	*0*	*0*	*4*	*6*	*8*	*13*	*11*	*6*	*1*	*49*
Rectum	*0*	*1*	*4*	*9*	*7*	*13*	*2*	*4*	*1*	*41*
Others	*2*	*2*	*3*	*8*	*15*	*30*	*23*	*2*	*3*	*88*
Respiratory system	1	2	3	17	29	43	25	4	10	134
Lungs	*1*	*1*	*3*	*13*	*11*	*25*	*8*	*1*	*1*	*64*
Others	*0*	*1*	*0*	*4*	*18*	*18*	*17*	*3*	*9*	*70*
Genitourinary system	3	2	10	12	35	64	67	26	14	233
Prostate	*0*	*0*	*0*	*0*	*3*	*23*	*45*	*17*	*7*	*95*
Others	*3*	*2*	*10*	*12*	*32*	*41*	*22*	*9*	*7*	*138*
Skin	0	2	14	28	56	75	71	48	83	377
Brain	0	2	2	4	2	5	0	0	2	17
Bones	1	5	1	3	9	6	3	0	5	33
Breast	0	2	0	0	0	2	1	0	1	6
All others	3	5	9	10	19	18	16	7	14	101
All sites	11	24	67	140	251	386	288	119	164	1, 450

TABLE 9.—*Number of cancer cases reported, by primary site and age group, females only, New Orleans, 1937*

Primary site	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	Unknown	All ages
Buccal cavity	2	2	4	11	13	10	10	4	10	66
Lip	*0*	*0*	*1*	*2*	*4*	*1*	*3*	*1*	*5*	*17*
Others	*2*	*2*	*3*	*9*	*9*	*9*	*7*	*3*	*5*	*49*
Digestive tract	1	3	8	34	37	52	51	20	12	218
Stomach	*0*	*0*	*3*	*14*	*7*	*11*	*21*	*6*	*4*	*66*
Intestines	*1*	*2*	*3*	*8*	*14*	*22*	*14*	*7*	*6*	*77*
Rectum	*0*	*1*	*2*	*5*	*8*	*4*	*7*	*2*	*1*	*30*
Others	*0*	*0*	*0*	*7*	*8*	*15*	*9*	*5*	*1*	*45*
Respiratory system	0	1	1	3	3	4	2	0	4	18
Lungs	*0*	*0*	*0*	*3*	*3*	*4*	*1*	*0*	*1*	*12*
Others	*0*	*1*	*1*	*0*	*0*	*0*	*1*	*0*	*3*	*6*
Genitourinary system	3	4	65	140	191	160	82	20	28	688
Uterus	*0*	*4*	*57*	*119*	*156*	*137*	*59*	*6*	*15*	*553*
Others	*3*	*0*	*8*	*21*	*35*	*23*	*23*	*14*	*8*	*135*
Breast	0	4	16	81	95	95	55	17	38	401
Skin	0	3	16	26	37	55	55	27	78	292
Brain	2	2	5	5	3	1	0	0	2	20
Bones	1	4	5	5	6	1	7	0	1	30
All others	5	6	11	12	14	20	7	4	15	94
All sites	14	29	131	317	399	398	269	92	178	1, 827

Table 10.—*Number of recorded cancer deaths*[1] *with corresponding number of reported cases, by color, sex, and primary site, New Orleans, 1937*

Primary site	White				Total			
	Male		Female		Male		Female	
	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases
Buccal cavity, pharynx	35	194	6	45	37	210	9	57
Lip	*5*	*116*		*16*	*5*	*120*		*17*
Tongue	*14*	*26*	*3*	*8*	*15*	*33*	*3*	*10*
Mouth	*2*	*11*		*4*	*2*	*12*	*1*	*5*
Jaw	*4*	*7*	*1*	*8*	*4*	*9*	*1*	*10*
Pharynx	*3*	*6*		*2*	*4*	*7*	*1*	*3*
Others	*7*	*28*	*2*	*7*	*7*	*29*	*3*	*12*
Digestive tract	105	241	89	164	151	328	123	218
Esophagus	*2*	*14*	*2*	*3*	*6*	*24*	*3*	*8*
Stomach, duodenum	*45*	*101*	*22*	*38*	*70*	*150*	*43*	*66*
Intestines	*22*	*43*	*29*	*69*	*25*	*49*	*33*	*77*
Rectum, anus	*9*	*35*	*11*	*22*	*12*	*41*	*17*	*30*
Liver, biliary passage	*15*	*23*	*13*	*14*	*21*	*30*	*15*	*16*
Pancreas	*9*	*15*	*8*	*11*	*13*	*21*	*8*	*13*
Others	*3*	*10*	*4*	*7*	*4*	*13*	*4*	*8*
Respiratory system	45	120	6	16	54	134	6	18
Larynx	*13*	*60*		*2*	*16*	*64*		*2*
Lungs, pleura	*22*	*38*	*6*	*9*	*27*	*45*	*6*	*11*
Others	*10*	*22*		*5*	*11*	*25*		*5*
Genitourinary system	59	195	75	449	70	233	123	685
Uterus			*41*	*343*			*81*	*553*
Kidneys	*13*	*19*	*9*	*22*	*16*	*26*	*10*	*24*
Bladder	*22*	*71*	*13*	*30*	*23*	*73*	*14*	*35*
Prostate	*22*	*78*			*27*	*95*		
Others	*2*	*27*	*12*	*54*	*4*	*39*	*18*	*73*
Breast		3	44	303		6	62	401
Skin	13	369	9	280	14	377	9	292
Brain	1	15	1	20	1	17	1	20
Bones	5	30	3	15	5	33	4	30
All others	18	95	16	77	22	112	32	106
All sites	281	1,262	249	1,369	354	1,450	369	1,827

[1] Cancer deaths include those which were not reported as cases.

Table 11.—*Number of reported cases of cancer by months since first diagnosis, color, and vital status, New Orleans, 1937*

Months since first diagnosis	Vital status				Total		All cases
	Alive[1]		Dead		White	Colored	
	White	Colored	White	Colored			
Under 6	867	179	363	148	1,230	327	1,557
6-11	680	159	72	21	752	180	932
12-17	167	37	42	10	209	47	256
18-23	82	22	15	2	97	24	121
24-29	67	16	9	2	76	18	94
30-35	40	10	10		50	10	60
36-41	37	6	7		44	6	50
42-47	26	7	4	2	30	9	39
48-53	25	10	4		29	10	39
54-59	15	2	2		17	2	19
60-65	11	6	2		13	6	19
66-71	13		2	1	15	1	16
72-77	8	1	2	1	10	2	12
78-83	7				7		7
84-89	4		1		5		5
90-95	3				3		3
96 and over	30	3	2		32	3	35
Unknown	8	1	4		12	1	13
Total	2,090	459	541	187	2,631	646	3,277

[1] There were 779 cases reported as of "unknown" vital status. These cases largely represent the reports of 2 radiologists who listed all their cases (except known dead ones) as unknown. Since they were alive on the date in 1937 on which they were last seen, and since no cancer death certificate was found for them, they are here included with the "alive" group.

TABLE 12a.—*Number of reported living[1] cases of cancer, by months since first diagnosis and primary site, New Orleans, 1937*

Primary site	Months since first diagnosis												
	Under 6	6–11	12–17	18–23	24–29	30–35	36–41	42–47	48–53	54–59	60 and over	Unknown	Total
Buccal cavity, pharynx	85	78	25	7	14	7	4	7	5	2	7	-------	241
Lip	*50*	*41*	*15*	*5*	*6*	*4*	*2*	*4*	*2*	*1*	*2*	-------	*132*
Tongue	*5*	*13*	*2*	-----	*2*	-----	*1*	*1*	*1*	-----	*1*	-------	*26*
Mouth	*3*	*7*	*2*	-----	-----		-----	-----	-----	-----	*1*	-------	*13*
Jaw	*5*	*4*	*2*	-----	-----	*2*	-----	*1*	-----	-----	*1*	-------	*15*
Pharynx	*6*	*1*	*1*	-----	-----	*1*	-----	-----	-----	-----	-----	-------	*9*
Others	*16*	*12*	*3*	*2*	*6*	-----	*1*	*1*	*2*	*1*	*2*	-------	*46*
Digestive tract	129	128	15	4	6	2	-----	1	1	1	4	2	293
Esophagus	*11*	*10*	-----	-----	-----	-----	-----	-----	-----	-----	-----	-------	*21*
Stomach, duodenum	*50*	*71*	*3*	*2*	*1*	*1*	-----	-----	-----	-----	*1*	-------	*129*
Intestines	*34*	*19*	*7*	*2*	*2*	*1*	-----	*1*	-----	-----	*1*	*1*	*68*
Rectum, anus	*18*	*18*	*3*	-----	*1*	-----	-----	-----	-----	*1*	*2*	*1*	*44*
Liver, biliary passage	*5*	*6*	*1*	-----	*1*	-----	-----	-----	-----	-----	-----	-------	*13*
Pancreas	*7*	*2*	-----	-----	*1*	-----	-----	-----	*1*	-----	-----	-------	*11*
Others	*4*	*2*	*1*	-----	-----	-----	-----	-----	-----	-----	-----	-------	*7*
Respiratory system	43	32	9	4	2	3	2	-----	-----	-----	2	1	98
Larynx	*17*	*19*	*4*	*3*	*1*	*3*	*1*	-----	-----	-----	*2*	*1*	*51*
Lungs, pleura	*20*	*9*	*5*	*1*	*1*	-----	*1*	-----	-----	-----	-----	-------	*37*
Others	*6*	*4*	-----	-----	-----	-----	-----	-----	-----	-----	-----	-------	*10*
Genitourinary system	292	253	49	35	22	9	3	10	12	7	18	-------	710
Uterus	*184*	*175*	*34*	*24*	*16*	*8*	*2*	*6*	*7*	*7*	*9*	-------	*472*
Kidneys	*7*	*10*	*1*	-----	*1*	-----	-----	-----	-----	-----	*1*	-------	*20*
Bladder	*35*	*19*	*5*	*3*	*4*	-----	-----	*1*	*1*	-----	*2*	-------	*70*
Prostate	*23*	*25*	*4*	*5*	-----	-----	*1*	*1*	*2*	-----	*2*	-------	*63*
Others	*43*	*24*	*5*	*3*	*1*	*1*	-----	*2*	*2*	-----	*4*	-------	*85*
Breast	102	106	33	26	17	12	16	4	4	3	10	-------	333
Skin	282	169	46	24	19	15	16	9	12	2	38	6	638
Brain	11	16	2	-----	-----	1	-----	-----	-----	-----	-----	-------	30
Bones	19	11	8	3	-----	-----	2	-----	1	1	2	-------	47
All others	83	46	17	1	3	1	-----	2	1	1	4	-------	159
All sites	1,046	839	204	104	83	50	43	33	36	17	85	9	2,549

[1] Cases reported as "vital status unknown" are included here.

TABLE 12b.—*Number of reported dead cases of cancer, by months since first diagnosis and primary site, New Orleans, 1937*

Primary site	Months since first diagnosis												
	Under 6	6-11	12-17	18-23	24-29	30-35	36-41	42-47	48-53	54-59	60 and over	Unknown	Total
Buccal cavity, pharynx	26	9		2	2	2		1	2		2		46
Lip	*3*			*1*				*1*					*5*
Tongue	*7*	*8*							*1*		*1*		*17*
Mouth	*1*	*1*			*1*				*1*				*4*
Jaw	*4*												*4*
Pharynx	*1*												*1*
Others	*10*			*1*	*1*	*2*					*1*		*15*
Digestive tract	213	19	10	4	1	1		2		1	1	1	253
Esophagus	*10*		*1*										*11*
Stomach, duodenum	*76*	*7*	*2*	*2*									*87*
Intestines	*49*	*4*	*3*	*1*				*1*					*58*
Rectum, anus	*19*	*1*	*3*		*1*	*1*				*1*		*1*	*27*
Liver, biliary passage	*28*	*3*	*1*	*1*									*33*
Pancreas	*22*										*1*		*23*
Others	*9*	*4*						*1*					*14*
Respiratory system	42	8	2		1		1						54
Larynx	*10*	*3*	*1*		*1*								*15*
Lungs, pleura	*32*	*5*	*1*				*1*						*39*
Others													
Genitourinary system	140	29	22	6	3	3	2				3	3	211
Uterus	*46*	*14*	*13*	*4*	*1*		*1*				*1*	*1*	*81*
Kidneys	*26*	*2*	*1*		*1*								*30*
Bladder	*28*	*2*	*2*	*1*		*2*					*1*	*2*	*38*
Prostate	*20*	*6*	*3*	*1*	*1*	*1*							*32*
Others	*20*	*5*	*3*				*1*				*1*		*30*
Breast	32	14	8	1	4	4	2	3		1	5		74
Skin	15	3	6	3			2		2				31
Brain	6	1											7
Bones	10	4	2										16
All others	27	6	2	1									36
All sites	511	93	52	17	11	10	7	6	4	2	11	4	728

TABLE 13.—*Number of cancer cases under observation only during study year, by months since last treated, sex, and color, and by reporting source, New Orleans, 1937*

Months since last treated	Number of cases under observation only							Number of cases by reporting source [1]	
	All		White		Colored		Total	Doctors only	Hospitals only
	Male	Female	Male	Female	Male	Female			
Under 6	13	15	13	14		1	28	10	18
6-11	8	9	8	7		2	17	8	9
12-17	2	7	2	6		1	9	4	5
18-23	9	4	8	2	1	2	13	6	7
24-29	2	6	2	4		2	8	1	7
30-35	2	3	2	2		1	5	2	3
36-41	3	4	3	3		1	7	3	4
42-47	1	1	1	1			2	1	1
48-53	1		1				1	1	
54-59	2		2				2	2	
60-65		1		1			1	1	
66-71		1		1			1	1	
72-77									
78-83									
84-89		4		4			4	4	
90-95									
96 and over	3	3	3	2		1	6	5	1
Unknown	18	19	18	19			37	37	
Total	64	77	63	66	1	11	141	86	55

[1] None of the cases under observation only were reported by both doctor and hospital.

TABLE 14.—*Number of cancer cases that were under observation only during the study year, by months since last treated and primary site, with the number of cases treated, and the total number reported, New Orleans, 1937*

Months since last treated	Primary site									All sites combined
	Buccal cavity	Digestive tract	Respiratory	Genitourinary	Breast	Skin	Brain	Bones	All other sites	
Under 6	3			5	5	13			2	28
6–11	2			2	4	8		1		17
12–17	2	2				5				9
18–23	1			2	2	7			1	13
24–29	2			3	2	1				8
30–35				1	1	2			1	5
36–41				4	1	2				7
42–47				1		1				2
48–53						1				1
54–59		1				1				2
60–65						1				1
66–71						1				1
72–77										
78–83										
84–89					1	3				4
90–95										
96 and over						5			1	6
Unknown	4	3		2	6	17	1	1	3	37
Total	14	6		20	22	68	1	2	8	141
Number treated in 1937	273	540	152	901	385	601	36	61	187	3,136
Total number of cases	287	546	152	921	407	669	37	63	195	3,277

TABLE 15.—*Number of cancer cases under observation only during the study year, by months since last treated and by age groups, New Orleans, 1937*

Months since last treated	Age in years									All ages
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	Unknown	
Under 6			2	2	4	7	7	5	1	28
6–11		1	1		3	4	5	2	1	17
12–17				1	1	2	1	2	2	9
18–23			1		6	3	1	2		13
24–29			2	1	2	1	2			8
30–35		1			2	1			1	5
36–41				1	2	1	3			7
42–47					1	1				2
48–53									1	1
54–59						1	1			2
60–65						1				1
66–71								1		1
72–77										
78–83										
84–89					1	2		1		4
90–95										
96 and over		1				3			2	6
Unknown	1		2	3	10	12	7		2	37
Total	1	3	8	8	32	39	27	13	10	141

TABLE 16.—*Number of cases of cancer first seen in 1937, by primary site, sex, color, and residence, New Orleans*

Primary site	Number of cases first seen in 1937									
	White				Colored				Total	
	Resident [1]		Nonresident		Resident [1]		Nonresident			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Buccal cavity	73	21	58	13	3	6	6	3	140	43
Digestive tract	123	94	82	33	43	36	34	12	282	175
Respiratory	51	11	36	2	5	1	8	1	100	15
Genitourinary	83	222	57	111	11	116	18	58	169	507
Breast	3	136		50	2	32		17	5	235
Skin	159	142	81	56	4	4	3	1	247	203
Brain	6	7	8	10	1		1		16	17
Bones	11	5	10	2	3	5		7	24	19
All other sites	36	34	30	20	6	15	7	4	79	73
All sites	545	672	362	297	78	215	77	103	1,062	1,287

[1] 107 cases of unknown residence included with residents.

TABLE 17.—*Number of cancer cases first seen in 1937, by sex, color, age distribution, and residence, New Orleans*

Age group	Number of cases									
	All white		All colored		White residents		Colored residents		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Under 5	3	2	1	2	1	1		1	4	4
5–9	2	1	2		1	1	1		4	1
10–14		5		1		1		1		6
15–19	7	4	5	2	6	3	2		12	6
20–24	7	10	3	7	6	6	2	5	10	17
25–29	13	20	3	28	6	14	1	19	16	48
30–34	28	37	5	24	16	21	3	13	33	61
35–39	34	72	6	23	16	52	4	20	40	95
40–44	51	89	12	44	28	59	5	27	63	133
45–49	76	100	15	31	38	63	8	23	91	131
50–54	78	97	15	43	43	67	8	30	93	140
55–59	118	97	25	40	73	61	12	27	143	137
60–64	110	99	24	24	68	75	12	14	134	123
65–69	100	88	18	26	49	58	10	18	118	114
70–74	74	55	14	11	47	41	5	7	88	66
75–79	51	39	1	5	34	33		3	52	44
80–84	11	14	2	2	5	8	2	2	13	16
85–89	8	4	1		5	4	1		9	4
90–94										
95 and over	1	1	1			1	1		2	1
Unknown	135	135	2	5	103	103	1	5	137	140
Total	907	969	155	318	545	672	78	215	1,062	1,287

Table 18.—*Number of cases of cancer first seen in 1937, by primary site and age (males only), New Orleans*

Primary site	Number of cases in each age group									All ages
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	Unknown	
Buccal cavity	1	1	7	21	30	42	19	5	14	140
Lip	------	*1*	*4*	*17*	*23*	*15*	*7*	*4*	*8*	*79*
Others	*1*	------	*3*	*4*	*7*	*27*	*12*	*1*	*6*	*61*
Digestive tract	1	3	12	27	48	88	69	18	16	282
Stomach	------	------	*3*	*10*	*25*	*41*	*36*	*8*	*12*	*135*
Intestines	------	------	*4*	*6*	*8*	*12*	*9*	*5*	*1*	*45*
Rectum	------	*1*	*2*	*5*	*5*	*9*	*2*	*3*	*1*	*28*
Others	*1*	*2*	*3*	*6*	*10*	*26*	*22*	*2*	*2*	*74*
Respiratory system	1	2	2	11	22	38	14	3	7	100
Lungs	*1*	*1*	*2*	*8*	*10*	*24*	*5*	*1*	------	*52*
Others	------	*1*	*2*	*3*	*12*	*14*	*9*	*2*	*7*	*48*
Genitourinary system	3	2	8	9	26	46	47	17	11	169
Prostate	------	------	------	------	*2*	*20*	*30*	*12*	*6*	*70*
Others	*3*	*2*	*8*	*9*	*24*	*26*	*17*	*5*	*5*	*99*
Skin	------	1	11	21	32	42	42	28	70	247
Brain	------	1	2	4	2	5	------	------	2	16
Bones	1	5	------	2	7	3	2	------	4	24
All others	1	7	7	8	17	13	13	5	13	84
All sites	8	22	49	103	184	277	206	76	137	1,062

Table 19.—*Number of cases of cancer first seen in 1937, by primary site and age (females only), New Orleans*

Primary site	Number of cases in each age group									All ages
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	Unknown	
Buccal cavity	2	1	3	7	9	5	6	3	7	43
Digestive tract	1	3	8	31	29	35	40	17	11	175
Stomach	------	------	*3*	*14*	*6*	*8*	*17*	*5*	*4*	*57*
Intestines	*1*	*2*	*3*	*7*	*10*	*13*	*11*	*6*	*5*	*58*
Rectum	------	*1*	*2*	*5*	*6*	*3*	*5*	*2*	*1*	*25*
Others	------	------	------	*5*	*7*	*11*	*7*	*4*	*1*	*35*
Respiratory system	------	1	1	3	1	3	2	------	4	15
Genitourinary system	2	4	57	96	139	118	56	15	20	507
Uterus	----	*4*	*51*	*83*	*110*	*97*	*36*	*4*	*12*	*397*
Others	*2*	------	*6*	*13*	*29*	*21*	*20*	*11*	*8*	*110*
Breast	------	3	10	54	52	55	29	11	21	235
Skin	------	8	12	21	26	27	37	16	61	203
Brain	2	2	4	4	3	1	------	------	1	17
Bones	1	2	4	2	4	------	5	------	1	19
All others	3	4	10	10	8	16	5	3	14	73
All sites	11	23	109	228	271	260	180	65	140	1,287

DEATHS DURING WEEK ENDED MAY 17, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 17, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,070	8,390
Average for 3 prior years	8,191	
Total deaths, first 20 weeks of year	182,591	183,711
Deaths per 1,000 population, first 20 weeks of year, annual rate	12.7	12.8
Deaths under 1 year of age	521	493
Average for 3 prior years	495	
Deaths under 1 year of age, first 20 weeks of year	10,619	10,215
Data from industrial insurance companies:		
Policies in force	64,507,375	65,523,880
Number of death claims	10,882	12,182
Death claims per 1,000 policies in force, annual rate	8.8	9.7
Death claims per 1,000 policies, first 20 weeks of year, annual rate	10.4	10.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 24, 1941

Summary

A total of 35,044 cases of measles was reported for the current week, as compared with 37,941 cases for the preceding week. Slight increases were recorded for the West South Central, Mountain, and Pacific States, while the incidence declined in all other geographic areas.

As compared with the preceding week, increases were reported for diphtheria, influenza, meningococcus meningitis, poliomyelitis, and typhoid fever. The incidence of influenza, measles, meningococcus meningitis, poliomyelitis, and whooping cough was above the 5-year (1936–40) median expectancy, and the cumulative totals (first 21 weeks) for these diseases, with the exception of meningococcus meningitis, were above the median.

Of 27 cases of poliomyelitis, 10 were reported in Florida and 5 in California. A total of 491 cases has been reported to date this year, as compared with 499 for the corresponding period last year. One-fourth of the cases reported in the past three weeks occurred in Florida.

Of 30 cases of Rocky Mountain spotted fever, 24 were reported from the Mountain and Pacific States, and of 24 cases of endemic typhus fever, 11 cases occurred in Georgia.

Plague infection was reported in ground squirrels and fleas from ground squirrels in Kern and Monterey Counties, California.

The death rate for the current week in 87 major cities of the United States, as reported by the Bureau of the Census, was 11.6 per 1,000 population, as compared with 11.3 for the preceding week and with a 3-year average (1938–40) of 11.4 (88 cities). The cumulative rate for the first 21 weeks of 1941 is 12.7, as compared with 12.8 for the corresponding period of 1940. (All rates are on an annual basis.)

Telegraphic morbidity reports from State health officers for the week ended May 24, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40
	May 24, 1941	May 25, 1940		May 24, 1941	May 25, 1940		May 24, 1941	May 25, 1940		May 24, 1941	May 25, 1940	
NEW ENG.												
Maine	0	1	0	------	------	------	97	449	156	0	0	0
New Hampshire	0	0	0	------	------	------	31	28	3	1	1	0
Vermont	1	1	0	------	------	------	88	13	140	0	0	0
Massachusetts	0	3	3	------	------	------	958	869	860	1	0	1
Rhode Island	0	0	0	------	------	------	2	188	70	0	0	0
Connecticut	0	2	2	------	3	1	397	17	181	1	1	1
MID. ATL.												
New York [1, 3]	19	20	22	[2] 3	[2] 7	[2] 7	3,596	888	2,181	7	1	5
New Jersey	7	7	7	2	4	4	2,324	990	708	2	0	1
Pennsylvania	6	17	24	------	------	------	5,887	453	1,257	9	5	8
E. NO. CEN.												
Ohio	12	9	9	13	7	7	2,994	25	435	3	1	4
Indiana	5	1	5	21	1	3	1,200	5	13	2	2	2
Illinois [1]	13	16	36	22	3	54	1,450	174	174	1	0	0
Michigan [4]	3	4	9	4	2	2	2,232	------	192	3	1	1
Wisconsin	4	7	4	24	53	34	1,644	1,162	785	0	0	0
W. NO. CEN.												
Minnesota	8	1	1	2	1	1	21	140	254	1	0	0
Iowa [1]	2	4	3	10	------	1	140	416	207	2	0	0
Missouri [3]	5	5	7	4	6	18	587	25	25	0	0	0
North Dakota	0	0	1	------	------	------	107	5	5	0	0	0
South Dakota	1	0	1	------	------	------	37	2	2	0	0	0
Nebraska	0	1	1	------	------	------	87	16	22	0	0	0
Kansas	3	3	3	7	1	1	557	392	97	2	0	1
SO. ATL.												
Delaware	0	1	0	------	------	------	85	0	11	0	0	0
Maryland [1, 4]	4	3	3	1	4	8	401	17	165	3	1	1
Dist. of Col.	0	2	5	1	------	------	248	4	146	0	0	0
Virginia	9	6	9	59	57	26	1,343	286	325	2	2	2
West Virginia [4]	7	6	5	4	9	23	619	32	35	1	2	2
North Carolina	6	3	6	3	4	3	1,597	110	298	3	0	1
South Carolina [3]	5	5	4	138	299	104	272	5	62	1	2	1
Georgia [3]	2	7	6	14	23	------	360	112	72	0	0	0
Florida [3]	0	1	6	29	3	3	475	152	19	0	0	0
E. SO. CEN.												
Kentucky	5	3	7	------	12	9	962	113	113	0	0	2
Tennessee [1]	7	5	5	21	16	16	341	133	87	0	0	2
Alabama [3]	7	2	7	21	34	28	269	165	149	0	2	2
Mississippi [4]	1	2	4	------	------	------	------	------	------	1	1	1
W. SO. CEN.												
Arkansas	2	2	3	258	16	26	317	39	39	0	0	0
Louisiana [3]	0	1	5	1	13	13	27	4	13	2	2	1
Oklahoma	7	3	3	19	21	18	152	13	60	0	0	1
Texas [3]	18	13	25	442	126	138	1,146	1,350	482	0	1	2
MOUNTAIN												
Montana [1]	1	0	1	2	9	9	63	81	81	0	0	0
Idaho [1]	0	0	0	------	------	3	6	40	16	0	0	0
Wyoming [1]	6	0	0	------	3	------	277	16	16	0	0	0
Colorado [1]	8	16	8	20	2	------	542	29	36	0	0	1
New Mexico	2	4	4	------	8	2	106	87	75	0	0	0
Arizona	3	1	0	58	55	40	110	118	41	0	0	0
Utah [1, 4]	5	0	0	7	------	------	42	507	73	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington [1]	1	0	3	2	------	------	15	502	437	0	1	0
Oregon [1]	2	3	2	2	10	18	140	519	83	0	0	0
California [3]	11	8	24	222	64	52	734	272	564	1	0	6
Total	208	199	305	1,436	876	876	35,044	10,963	12,971	49	26	47
21 weeks	5,660	6,849	9,998	588,857	164,052	146,309	606,002	161,950	207,146	1,021	858	1,639

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 24, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	May 24, 1941	May 25, 1940		May 24, 1941	May 25, 1940		May 24, 1941	May 25, 1940		May 24, 1941	May 25, 1940	
NEW ENG.												
Maine	0	0	0	13	13	14	0	0	0	0	0	0
New Hampshire	0	0	0	0	3	7	0	0	0	0	0	0
Vermont	0	0	0	4	4	5	0	0	0	0	0	0
Massachusetts	0	0	0	197	120	202	0	0	0	1	4	1
Rhode Island	0	0	0	7	4	16	0	0	0	1	0	0
Connecticut	0	0	0	58	75	75	0	0	0	2	0	0
MID. ATL.												
New York [1, 3]	1	1	1	546	948	703	0	0	0	17	5	5
New Jersey	2	0	0	278	362	221	0	0	0	1	1	2
Pennsylvania	0	1	1	384	401	401	0	0	0	6	15	10
E. NO. CEN.												
Ohio	0	1	1	260	213	241	1	0	1	3	7	8
Indiana	1	0	0	87	115	94	0	1	9	2	6	2
Illinois [1]	1	0	1	269	797	512	3	2	10	5	4	4
Michigan [4]	0	2	1	267	268	381	6	0	9	0	3	3
Wisconsin	0	0	0	100	149	161	2	6	5	0	1	2
W. NO. CEN.												
Minnesota	1	0	0	40	74	79	0	4	11	0	1	0
Iowa [1]	0	0	0	26	78	88	4	15	33	2	1	2
Missouri [3]	0	0	0	99	37	55	4	2	11	1	3	1
North Dakota	0	0	0	2	6	7	0	1	2	0	1	1
South Dakota	0	0	0	5	6	8	4	2	10	0	0	0
Nebraska	0	0	0	9	7	25	0	0	3	0	1	0
Kansas	0	0	0	20	60	84	0	0	18	4	0	0
SO. ATL.												
Delaware	0	0	0	19	4	4	0	0	0	0	0	1
Maryland [1, 4]	0	0	0	39	23	38	0	0	0	3	1	3
Dist. of Col.	0	0	0	14	26	15	0	0	0	0	0	0
Virginia	0	0	0	15	26	17	0	0	0	3	5	5
West Virginia [4]	0	0	0	38	34	28	0	0	0	2	4	4
North Carolina	1	0	0	12	8	12	0	0	0	2	4	4
South Carolina [3]	0	1	0	5	5	4	0	0	0	3	1	2
Georgia [3]	0	0	0	13	12	8	0	0	0	13	14	8
Florida [3]	10	1	1	2	3	4	0	1	0	1	2	6
E. SO. CEN.												
Kentucky	0	1	1	85	30	24	0	0	0	5	5	5
Tennessee [1]	0	0	0	51	71	13	3	8	0	8	8	5
Alabama [3]	1	1	1	19	6	5	0	1	1	0	1	1
Mississippi [4]	2	0	0	1	6	4	1	0	0	0	3	3
W. SO. CEN.												
Arkansas	0	0	0	2	5	5	1	0	9	3	1	3
Louisiana [3]	0	1	1	4	6	10	0	0	0	4	14	13
Oklahoma	0	0	0	13	6	16	1	3	3	7	2	6
Texas [3]	1	0	0	33	24	49	1	4	4	3	7	8
MOUNTAIN												
Montana [1]	0	0	0	6	15	21	0	0	12	0	1	0
Idaho [1]	0	1	0	4	10	4	2	0	6	0	1	1
Wyoming [1]	0	0	0	0	1	5	0	0	1	0	0	0
Colorado [1]	0	0	0	18	20	44	0	3	3	0	3	2
New Mexico	0	0	0	5	7	10	0	1	0	0	1	1
Arizona	0	0	0	6	10	10	0	1	1	0	0	1
Utah [1, 4]	0	1	0	13	10	15	1	1	0	0	0	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington [1]	0	10	0	17	37	37	0	0	4	0	0	0
Oregon [1]	1	1	0	5	10	18	1	0	4	4	4	2
California [3]	5	9	4	108	117	194	0	1	15	1	6	6
Total	27	32	22	3,218	4,272	4,272	35	57	269	107	141	150
21 weeks	491	499	432	76,766	100,689	117,582	956	1,498	6,508	1,690	1,811	2,414

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 24, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended May 24, 1941	Whooping cough, Week ended May 25, 1940
NEW ENG.		
Maine	19	34
New Hampshire	16	4
Vermont	13	36
Massachusetts	357	161
Rhode Island	23	7
Connecticut	66	37
MID. ATL.		
New York [1] [2]	270	313
New Jersey	194	100
Pennsylvania	435	277
E. NO. CEN.		
Ohio	370	200
Indiana	32	27
Illinois [1]	106	87
Michigan [4]	379	195
Wisconsin	111	108
W. NO. CEN.		
Minnesota	90	40
Iowa [1]	28	50
Missouri [3]	65	21
North Dakota	20	3
South Dakota	16	4
Nebraska	6	7
Kansas	130	63
SO. ATL.		
Delaware	0	10
Maryland [1] [4]	146	106
Dist. of Col	10	5
Virginia	83	66
West Virginia [4]	89	60
North Carolina	345	87
SO. ATL.—continued		
South Carolina [3]	89	23
Georgia [3]	47	11
Florida [3]	24	15
E. SO. CEN.		
Kentucky	40	88
Tennessee [1]	65	64
Alabama [3]	68	28
Mississippi [4]	-------	-------
W. SO. CEN.		
Arkansas	70	12
Louisiana [3]	5	54
Oklahoma	26	31
Texas [3]	309	434
MOUNTAIN		
Montana [1]	4	0
Idaho [1]	6	16
Wyoming [1]	3	5
Colorado [1]	205	9
New Mexico	40	67
Arizona	35	75
Utah [1] [4]	34	200
Nevada	0	-------
PACIFIC		
Washington [1]	108	83
Oregon [1]	34	20
California [3]	811	462
Total	5,442	3,805
21 weeks	96,623	66,492

[1] Rocky Mountain spotted fever, week ended May 24, 1941, 30 cases, as follows: New York, 1; Illinois, 1; Iowa, 1; Maryland, 1; Tennessee, 2; Montana, 11; Idaho, 2; Wyoming, 7, Colorado, 1; Utah, 1; Washington, 1; Oregon, 1.
[2] New York City only.
[3] Typhus fever, week ended May 24, 1941, 24 cases, as follows: New York, 1; Missouri, 1; South Carolina, 3; Georgia, 11; Florida, 2; Alabama, 1; Louisiana, 1; Texas, 3; California, 1.
[4] Period ended earlier than Saturday.

PLAGUE INFECTION IN CALIFORNIA

In Rats in Contra Costa County

Under date of May 13, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in organs from two rats, *R. norvegicus*, taken from a garbage dump at the foot of Gertrude Avenue, Richmond, Contra Costa County, Calif., and submitted to the laboratory on April 28.

In Ground Squirrels and Fleas in Kern County

Under date of May 16, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved in organs from a ground squirrel, *C. beecheyi*, submitted to the laboratory on May 1, 1941; in a pool of 103 fleas from 15 ground squirrels from a ranch 12 miles east of Wheeler Ranch; in a pool of 51 fleas from 22 ground squirrels submitted to the laboratory on April 24 from a ranch 6 miles south of Davis Ranger Station; and in a pool of 112 fleas from 10 ground squirrels submitted to the laboratory on April 24 from a ranch 3 miles south of Davis Ranger Station, Kern County, Calif.

According to a report dated May 14, from N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., two ground squirrels (*C. beecheyi*) instead of one were taken on the same day near Tehachapi, Kern County, and proved positive for plague infection. (See Public Health Reports of May 16, 1941, p. 1067.)

In Fleas From Ground Squirrels in Monterey County

Under date of May 16, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved in a pool of 354 fleas from 57 ground squirrels, *C. beecheyi*, submitted to the laboratory on April 29, from a military reservation 25 miles southwest of King City, Monterey County, Calif.

MONTHLY REPORTS FROM STATES

Case reports consolidated for the quarter January–March 1941

Division and State	Actinomycosis	Chickenpox	Diphtheria	Dysentery, amoebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	German measles	Hookworm disease	Influenza	Malaria	Measles	Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
NEW ENG.																	
Maine	-	1,068	1	-	-	-	-	254	-	4,356	-	1,096	1	271	-	-	262
New Hampshire	-	104	-	-	-	-	-	-	-	1,170	-	427	2	501	-	-	30
Vermont	-	640	-	-	-	-	-	77	-	403	-	271	1	623	-	-	23
Massachusetts	-	4,085	23	-	18	-	4	299	-	-	1	6,911	26	2,881	(1)	3	[2] 1,885
Rhode Island	-	495	1	-	-	-	-	35	-	428	-	27	4	65	-	-	152
Connecticut	-	2,192	5	1	5	-	1	266	1	4,869	1	632	4	1,876	-	-	1,602
MID. ATL.																	
New York	-	11,891	146	7	115	-	36	7,200	-		16	58,176	47	-	27	-	12,749
New Jersey	-	8,658	146	10	2	-	4	6,937	-	4,533	2	20,439	15	4,907	19	-	2,458
Pennsylvania	-	15,619	202	-	-	-	8	1,903	-	-	-	43,319	60	10,399	1	3	3,162
E. NO. CEN.																	
Ohio	-	7,921	109	2	6	-	4	519	-	11,065	-	38,521	16	2,104	-	-	1,953
Indiana	-	1,754	189	-	-	-	1	158	-	2,218	-	5,175	15	613	-	-	407
Illinois	1	7,534	248	17	46	-	8	1,109	1	1,084	6	31,045	13	5,729	10	3	6,143
Michigan	1	7,000	66	1	4	-	2	659	-	1,746	1	35,003	10	-	-	-	1,913
Wisconsin	-	7,688	5	-	-	-	1	34	-	3,674	-	8,565	5	3,233	-	-	[2] 436
W. NO. CEN.																	
Minnesota	2	1,850	18	2	3	-	2	-	-	4,591	-	99	7	-	-	-	668
Iowa	-	1,411	102	-	-	3	1	16	-	3,835	-	2,059	0	2,294	-	1	1,000
Missouri	-	1,114	89	-	6	-	4	-	-	1,221	13	1,274	10	243	-	-	1,091
North Dakota	1	490	36	-	-	-	1	-	-	899	-	145	0	412	-	-	443
South Dakota	-	156	19	-	2	-	-	-	-	72	-	228	0	60	-	-	144
Nebraska	-	487	26	-	-	-	-	-	-	180	-	64	1	272	-	-	42
Kansas	-	2,110	45	2	-	-	7	51	-	7,663	2	6,154	8	180	-	2	1,260
SO. ATL.																	
Delaware	-	271	9	-	-	-	-	5	-	144	-	2,309	2	38	-	-	61
Maryland	-	2,035	48	2	13	2	-	1,779	-	2,828	-	1,361	18	693	1	1	1,804
Dist. of Col.	-	477	33	1	1	-	-	-	-	827	-	1,031	6	159	-	-	598
Virginia	-	1,384	123	-	136	-	-	-	-	59,918	3	13,980	24	782	-	14	2,406
West Virginia	-	659	85	-	39	-	1	-	-	45,099	1	3,118	30	389	-	3	663
North Carolina	-	2,400	206	-	2	-	-	4,348	-	5,659	36	6,087	13	-	-	12	324
South Carolina	-	850	208	-	-	-	-	2,082	325	48,389	761	2,291	11	494	2	272	3,136
Georgia	-	676	76	14	11	-	2	-	2,164	33,729	96	3,217	13	348	-	21	1,221
Florida	-	399	53	21	1	-	1	858	3,187	2,934	15	4,476	9	197	-	22	449

See footnotes at end of table.

Case reports consolidated for the quarter January–March 1941—Continued

Division and State	Actinomycosis	Chickenpox	Diphtheria	Dysentery, amoebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	German measles	Hookworm disease	Influenza	Malaria	Measles	Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
E. SO. CEN.																	
Kentucky		1,685	78	2	7		1	9		22,110	2	7,216	28	4,300			638
Tennessee		1,005	91	1	9		2	879	3	19,741	28	2,551	26	1,034	4	10	2,433
Alabama		576	88	2			2	252		33,273	147	3,898	32	1,258		35	2,640
Mississippi		2,225	52	418	1,039				2,408	70,145	2,402	6,066	29	2,974	29	711	4,530
W. SO. CEN.																	
Arkansas		433	109	5	5			346	10	24,052	131	1,646	9	1,000	1	38	1,312
Louisiana		203	63	3	5				231	12,113	18	362	15	128	1	3	697
Oklahoma		301	89	7	16		2			12,487	102	211	11	279	3	5	1,674
Texas		3,515	438	31	202		21			104,779	783	8,068	32	2,160	12	304	5,006
MOUNTAIN																	
Montana		950	41				5	17		3,714		115	1	154			52
Idaho		297	6					19		1,195		161	2	184			35
Wyoming	1	481	19				1	9		9,577	1	440	2	142			217
Colorado		2,269	105	2	15		6			4,776		2,028	2	1,032			446
New Mexico		418	19	2	2	5	2	41		866		1,758	3	373		2	509
Arizona		553	51			216	2	63		5,276	5	1,620	3	512	1	12	658
Utah		1,441	17	2				562		5,245		255	2	473			168
Nevada		165	2							399		88	1	5			31
PACIFIC																	
Washington		1,985	32	3	2		[3] 6	6,895		1,164		1,060	11	2,291			118
Oregon		840	18	1			1			1,962	2	2,862	4	975			363
California	1	12,319	209	29	91		10	4,862		16,493	11	2,484	28	6,047	9		[2] 917
Total	7	125,099	3,844	588	1,803	226	149	42,543	8,330	602,901	4,586	340,389	612	65,174	120	1,477	70,929
First quarter 1940	6	105,680	4,988	568	1,435	139	132	2,648	13,382	212,458	5,367	81,284	528	41,420	338	1,635	61,920
Alaska		45	3					770		4,899		268	4				69
Hawaii	1	373	33	1	45		2	474	31	360	2	1,721		26			[2] 58

[1] 325 cases of ophthalmia neonatorum and suppurative conjunctivitis reported. [2] Lobar pneumonia only. [3] 1 case of equine type also reported.

Case reports consolidated for the quarter January–March 1941—Continued

Division and State	Poliomyelitis	Puerperal septicemia	Rabies in animals	Rabies in man	Rocky Mountain spotted fever	Scarlet fever	Septic sore throat	Smallpox	Tetanus	Trachoma	Trichinosis	Tuberculosis, all forms	Tularemia	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Vincent's infection	Whooping cough
NEW ENG.																		
Maine	0				0	94	8	0	1		2	276		2		4	7	356
New Hampshire	0				0	53	10	0				52		2		2		45
Vermont	0				0	118		0				33		4		18	19	148
Massachusetts	1		7		1	1, 774	65	0	1	10	8	874		22		16		2, 976
Rhode Island	1		3		0	112	42	0				752		2		2	2	185
Connecticut	2		1		0	599	103	0	1		6	334		10		23		870
MID. ATL.																		
New York	9		48	1	0	5, 438	262	0	2		61	3, 833	1	62	9	67	[4] 119	4, 525
New Jersey	1		88		0	3, 614	55	0	1	2	7	911		12		11		1, 416
Pennsylvania	6				0	3, 830		0	1		6	611	4	49		13		5, 599
E. NO. CEN.																		
Ohio	14	4		2	0	3, 398	71	12	1	2	42	1, 274	12	32	1	17		4, 191
Indiana	6		17		0	2, 047	1	19				[5] 239	12	22		6		289
Illinois	16		67		0	5, 447	18	42	5	96	2	2, 480	35	34		35	65	1, 301
Michigan	11		9		0	3, 037	347	32		89	4	1, 088	3	28		19	29	4, 213
Wisconsin	12				0	1, 705	42	84		2		242	4	4		23		1, 426
W. NO. CEN.																		
Minnesota	6		3		0	771	38	110	1	1	7	395	1	4		34		928
Iowa	10		8		0	764	57	45				[5] 119	9	15		55		439
Missouri	6				0	1, 191	67	67	1	39		578	16	22		7		595
North Dakota	0				0	132	8	2	1	1		65	8	3		2	10	245
South Dakota	3				1	246	7	10		4		59	4					140
Nebraska	0				0	368		5				59		1		2		288
Kansas	8		3		0	817	45	25	2	2		170	3	8	2	21	30	1, 416
SO. ATL.																		
Delaware	0		2		0	173		0				[5] 49						166
Maryland	6				0	761	92	0	2			712	4	18	1	1	45	1, 062
Dist. of Col	3				0	217		0				542	2	7	1			109
Virginia	7				1	631	688	0	2	3		[5] 505	15	34	3	3		1, 648
West Virginia	9			1	0	571	29	0				506		17				800
North Carolina	12				0	603	28	1					12	12	29	2	65	3, 693
South Carolina	1		95		0	142	6	3				170	5	38	24			1, 315
Georgia	9	1		2	0	293	159	1	2	3		476	28	25	102	16		345
Florida	31				0	64	6	0				258	1	30	24	6	36	151

See footnotes at end of table.

Case reports consolidated for the quarter January–March 1941—Continued

Division and State	Poliomyelitis	Puerperal septicemia	Rabies in animals	Rabies in man	Rocky Mountain spotted fever	Scarlet fever	Septic sore throat	Smallpox	Tetanus	Trachoma	Trichinosis	Tuberculosis, all forms	Tularemia	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Vincent's infection	Whooping cough
E. SO. CEN.																		
Kentucky	14				0	1,410	213	1		16		399	15	34		5		784
Tennessee	5	2			0	1,295	125	6	4	1		784	13	42	1	4	13	757
Alabama	6		30		0	297		7	5			584	4	23	27	5		485
Mississippi	8	64	5		0	86		10		24		302	9	12	21	18		2,551
W. SO. CEN.																		
Arkansas	7	2	70		0	142	304	7		915		242	10	31		7		304
Louisiana	8	1	11		0	99	44	3	3	1		[5] 358	13	50	14	8		92
Oklahoma	5				1	288	324	7		144	4	409	4	20		13	29	275
Texas	9		34		0	732		20		30		669	6	76	64	54		3,653
MOUNTAIN																		
Montana	6				8	393	44	1		3		123	4	4		4		262
Idaho	3	1			0	151	4	4				[4] 8		4			6	165
Wyoming	2				1	123	9	2				24	4	2		1	1	49
Colorado	1				0	403	8	36				[4] 145		19		5		684
New Mexico	1	2	35		0	67	20	3		7		229		17		2		287
Arizona	2				0	79	1	10		195		354		13		7		346
Utah	4				0	120	37	0				45	1	5		2		922
Nevada	0				1	9		1				14		7				31
PACIFIC																		
Washington	5		4		0	302	12	18	1	18		333		12		4	12	1,118
Oregon	4		20		3	138	17	4				159		8		2	11	124
California	25		101	1	0	1,754	24	4	13	50	26	2,457	3	53	3	64		5,302
Total	305	77	661	7	17	46,903	3,440	602	50	1,658	175	25,300	265	951	326	610	499	59,071
First quarter 1940	352	119	693	2	10	61,317	3,757	1,070	72	913	154	24,070	564	1,011	300	631	596	40,708
Alaska						3	63					219		7			2	
Hawaii	1					5			6	2		199		6	3	1		70

[4] Exclusive of New York City.

[5] Respiratory only.

Anthrax: Massachusetts, 1; New York, 4; New Jersey, 2; Pennsylvania, 5; Missouri, 1; Delaware, 2; District of Columbia, 1; Texas, 1; California, 1.
Botulism: California, 3.
Colorado tick fever: Colorado, 7.
Dengue: South Carolina, 8; Mississippi, 4; Texas, 6; California, 1.
Diarrhea: Ohio, 37 (under 2 years; enteritis included); Maryland, 27; South Carolina, 1,296; New Mexico, 18 (enteritis included); California, 15 (epidemic diarrhea of newborn).

Enteritis: Kansas, 1; Washington, 5 (2, under 2 years; 3, over 2 years).
Food poisoning: Washington, 4; California, 76.
Granuloma, coccidioidal: California, 15.
Leprosy: Hawaii Territory, 9; Mississippi, 1; Louisiana, 2; Wyoming, 1; California, 5.
Psittacosis: Connecticut, 1; Ohio, 1; Illinois, 1; Florida, 1.
Relapsing fever: Texas, 1.
Weil's disease: Hawaii Territory, 2; Michigan, 9.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 10, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	115	97	40	4,967	540	1,946	18	381	23	1,247	--------
Current week [1]	54	49	9	10,686	312	1,357	0	348	15	1,555	--------
Maine:											
Portland	0	------	0	1	3	0	0	0	0	10	20
New Hampshire:											
Concord	0	------	0	1	0	0	0	0	0	0	7
Nashua	0	------	0	0	0	0	0	0	0	12	9
Vermont:											
Barre	0	------	0	1	0	1	0	0	0	0	1
Burlington	0	------	0	1	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	8
Massachusetts:											
Boston	1	------	0	269	12	83	0	9	3	61	205
Fall River	0	------	0	1	0	7	0	4	0	1	40
Springfield	0	------	0	43	0	10	0	0	0	6	37
Worcester	0	------	0	23	6	12	0	1	0	0	55
Rhode Island:											
Pawtucket	0	------	0	1	0	8	0	0	0	3	14
Providence	0	------	0	6	6	2	0	2	0	10	74
Connecticut:											
Bridgeport	0	------	0	12	1	5	0	0	0	0	30
Hartford	0	------	0	2	1	6	0	0	0	8	40
New Haven	0	------	0	3	0	24	0	1	0	0	36
New York:											
Buffalo	0	------	0	91	5	24	0	2	0	24	101
New York	19	5	0	2,533	68	275	0	63	3	114	1,464
Rochester	0	------	0	262	3	2	0	0	0	17	68
Syracuse	0	------	0	0	1	2	0	3	0	3	54
New Jersey:											
Camden	0	------	0	7	1	15	0	1	0	2	26
Newark	0	------	0	96	0	36	0	7	0	5	96
Trenton	0	------	0	54	0	24	0	2	0	0	43
Pennsylvania:											
Philadelphia	1	1	1	567	15	134	0	26	1	72	450
Pittsburgh	1	4	3	1,403	8	23	0	6	1	55	162
Reading	0	------	0	88	1	4	0	3	0	8	26
Scranton	0	------	--------	48	-------	0	0	-------	0	3	--------
Ohio:											
Cincinnati	0	------	0	127	1	11	0	10	0	3	138
Cleveland	2	1	0	87	11	64	0	17	1	100	204
Columbus	0	1	1	109	2	9	0	2	0	17	73
Toledo	0	------	0	296	3	8	0	3	0	15	77
Indiana:											
Anderson	0	------	0	7	0	3	1	0	0	2	6
Fort Wayne	0	------	0	17	0	0	0	0	0	0	29
Indianapolis	1	------	0	580	6	10	0	5	0	20	97
Muncie	1	------	0	46	2	6	0	1	0	0	11
South Bend	0	------	0	38	0	1	0	0	0	0	17
Terre Haute	0	------	0	4	0	0	0	0	1	0	21
Illinois:											
Alton	0	------	0	13	0	2	0	0	0	2	7
Chicago	9	------	2	429	22	157	0	33	1	44	649
Elgin	0	------	0	16	1	0	0	0	0	0	4
Springfield	0	1	0	49	0	7	0	0	0	0	19
Michigan:											
Detroit	8	1	0	703	9	130	0	14	0	162	259
Flint	0	------	0	102	2	2	0	0	0	11	26
Grand Rapids	0	------	0	299	1	11	0	1	0	6	37
Wisconsin:											
Kenosha	0	------	0	98	0	5	0	0	0	0	9
Madison	0	------	0	22	0	7	0	0	0	1	11
Milwaukee	0	1	0	467	3	10	0	2	0	32	97
Racine	0	------	0	10	0	9	0	0	0	2	8
Superior	0	------	0	0	0	0	0	0	0	7	6
Minnesota:											
Duluth	0	------	0	1	1	0	0	0	0	23	25
Minneapolis	1	------	0	13	2	13	0	1	0	45	103
St. Paul	0	------	0	4	5	6	0	2	0	81	81

[1] Figures for Raleigh estimated, report not received.

City reports for week ended May 10, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0			8		0	0		0	0	
Davenport	0			5		1	0		0	0	
Des Moines	0			14		4	0		0	2	25
Sioux City	0			5		3	0		0	6	
Waterloo	0			16		0	1		0	0	
Missouri:											
Kansas City	0		1	141	5	9	0	3	0	5	92
St. Joseph	0		0	27	4	0	0	1	0	0	25
St. Louis	0		0	233	6	89	0	6	0	89	178
North Dakota:											
Fargo	0		0	0	0	0	0	0	0	13	6
Grand Forks	0			0		1	0		0	0	
Minot	0			9		1	0		0	7	8
South Dakota:											
Aberdeen	0			0		1	0		0	3	
Sioux Falls	0			0		1	0		0	0	9
Nebraska:											
Omaha	0		0	17	0	3	0	1	0	0	53
Kansas:											
Topeka	0		0	115	0	2	0	0	0	9	12
Wichita	0	1	0	7	3	0	0	2	0	10	35
Delaware:											
Wilmington	0		0	13	0	5	0	1	0	0	28
Maryland:											
Baltimore	0	3	0	139	10	22	0	14	0	71	225
Cumberland	0		0	6	0	0	0	0	0	4	9
Frederick	0		0	3	0	1	0	0	0	0	1
Dist. of Col.:											
Washington	1	1	0	257	9	5	0	8	0	20	159
Virginia:											
Lynchburg	1		0	4	0	0	0	0	0	4	7
Norfolk	0	2	0	198	0	2	0	0	0	3	35
Richmond	2		0	51	2	0	0	0	0	0	60
Roanoke	0		0	20	0	0	0	0	0	0	20
West Virginia:											
Charleston	0	1	0	1	1	0	0	1	0	0	24
Wheeling	0		0	69	1	1	0	0	0	2	19
North Carolina:											
Gastonia	1			18		0	0		0	0	
Raleigh											
Wilmington	0		0	17	1	1	0	1	0	20	13
Winston-Salem	0	1	0	4	0	1	0	1	0	11	9
South Carolina:											
Charleston	0	6	0	6	1	1	0	2	0	0	21
Florence	0		0	0	0	0	0	0	0	2	11
Greenville	0		0	15	0	0	0	0	0	4	4
Georgia:											
Atlanta	0	2	0	10	3	0	0	5	0	0	86
Brunswick	0		0	1	0	0	0	0	0	0	3
Savannah	0	2	0	3	1	7	0	1	0	0	41
Florida:											
Miami	0	1	2	8	0	0	0	0	0	3	39
St. Petersburg	0		0	75	1	0	0	0	0	0	27
Tampa	0		0	0	1	0	0	0	0	1	30
Kentucky:											
Ashland	1		0	1	0	0	0	0	0	5	6
Covington	0		0	4	2	2	0	2	0	0	22
Lexington	0		0	3	0	1	0	0	0	2	15
Louisville	0		0	632	4	45	0	4	0	18	58
Tennessee:											
Knoxville	0		0	34	1	6	0	0	0	0	32
Memphis	0		0	138	2	5	0	3	1	13	57
Nashville	0		0	60	0	7	0	2	1	8	42
Alabama:											
Birmingham	0	4	0	27	1	8	0	1	0	1	56
Mobile	0	1	0	4	0	1	0	4	0	0	26
Montgomery	1			18		1	0		0	0	
Arkansas:											
Fort Smith	0			5		0	0		0	0	
Little Rock	0		0	9	7	1	0	4	0	3	47
Louisiana:											
Lake Charles	0		0	2	0	0	0	0	0	0	1
New Orleans	1		0	2	10	2	0	10	0	35	132
Shreveport	0		0	0	4	1	0	2	1	1	45
Oklahoma:											
Oklahoma City	0	1	1	10	5	4	0	1	0	0	57
Tulsa	1		0	57	0	2	0	0	0	2	8

City reports for week ended May 10, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Texas:											
Dallas	2	------	0	44	3	0	0	4	1	3	52
Fort Worth	0	------	2	36	3	1	0	3	0	0	37
Galveston	0	------	0	0	2	0	0	4	0	0	25
Houston	0	------	0	1	4	0	0	7	0	9	95
San Antonio	1	------	0	5	4	1	0	7	0	6	70
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	11
Great Falls	0	------	0	0	0	0	0	0	0	1	4
Helena	0	------	0	0	0	0	0	0	0	0	3
Missoula	0	------	0	0	0	0	0	0	0	0	5
Idaho:											
Boise	0	------	0	7	0	0	0	2	0	0	7
Colorado:											
Colorado Springs	0	------	0	3	1	4	0	0	0	10	7
Denver	5	6	0	390	3	4	0	3	0	117	80
Pueblo	0	------	0	2	1	2	0	0	0	35	13
New Mexico:											
Albuquerque	0	------	0	29	0	0	0	2	0	0	4
Arizona:											25
Phoenix	0	30	--------	7	-------	0	0	-------	0	14	--------
Utah:											
Salt Lake City	0	------	0	6	3	1	0	0	0	19	25
Washington:											
Seattle	0	------	0	0	6	0	0	1	0	31	86
Spokane	0	------	0	3	1	0	0	0	0	2	30
Tacoma	0	------	0	1	0	1	0	0	0	2	30
Oregon:											
Portland	1	1	0	2	2	2	0	2	0	2	59
Salem	0	------	--------	0	-------	0	0	-------	0	0	--------
California:											
Los Angeles	0	6	0	79	7	34	0	19	0	53	368
Sacramento	2	------	1	2	3	0	0	3	0	38	36
San Francisco	1	------	0	6	6	8	0	7	0	52	178

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				**West Virginia:**			
Boston	2	1	0	Wheeling	0	1	0
Springfield	0	1	0	**Florida:**			
Connecticut:				Miami	0	0	4
Bridgeport	0	1	0	**Louisiana:**			
New York:				New Orleans	0	0	1
Buffalo	2	0	0	**Oklahoma:**			
New York	4	3	2	Tulsa	1	0	0
New Jersey:				**Texas:**			
Camden	0	0	1	Houston	1	0	1
Illinois:				**Oregon:**			
Chicago	2	0	0	Portland	0	0	1
Maryland:				**California:**			
Baltimore	3	0	0	Los Angeles	0	0	1

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Muncie, 1.
Pellagra.—Cases: Charleston, S. C., 2; Atlanta, 1; Savannah, 1; Houston, 1.
Typhus fever.—Cases: New York, 3; Atlanta, 1; Miami, 3; Montgomery, 1; Houston, 1.

TERRITORIES AND POSSESSIONS

PANAMA CANAL ZONE

Notifiable diseases—January-March 1941.—During the months of January, February, and March 1941, certain notifiable diseases, including imported cases, were reported in the Panama Canal Zone and terminal cities as follows:

Disease	January		February		March	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	13		16		15	
Diphtheria	11		7		9	
Dysentery (amoebic)	9		10	2	8	
Dysentery (bacillary)	2	2	2		2	1
Leprosy	3		1			1
Malaria	229	7	188	4	123	9
Measles	3		31		42	
Meningitis, meningococcus	1		1	1		
Mumps	2		1		2	
Paratyphoid fever	5		2		2	
Pneumonia	[1] 54	29		18		10
Poliomyelitis			1			
Tuberculosis		36		22		34
Typhoid fever			5		1	1
Typhus fever			1		2	
Whooping cough	[1] 18		[1] 6		[1] 5	

[1] In the Canal Zone only.

SAMOA (AMERICAN)

Vital statistics—Year 1940.—Following are vital statistics for American Samoa for the year 1940:

Number of births	491
Number of stillbirths	15
Deaths, all causes	175
Deaths per 1,000 population	13.49
Deaths under 1 year of age per 1,000 live births	101.83

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Weeks ended April 19 and 26, 1941.—During the weeks ended April 19 and 26, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Week ended April 19, 1941

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	3	9		5	13	1		3	3	37
Chickenpox		24	2	88	215	31	15	38	33	446
Diphtheria		15		22	4	5		1		47
Dysentery				5						5
Influenza		43			9				36	88
Lethargic encephalitis						2				2
Measles		190	77	473	1,403	63	133	99	347	2,785
Mumps				234	240	49	12	15	26	576
Pneumonia		18			14	2			12	46
Poliomyelitis				1						1
Scarlet fever	1	34	7	93	158	4	3	13	5	318
Smallpox							3			3
Tuberculosis	2	3	8	71	44	3	10	5		146
Typhoid and paratyphoid fever		1		14	2	1	2			20
Whooping cough		1		98	121		2	9	19	250

Week ended April 26, 1941

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	10		4	18	1	1	1	3	39
Chickenpox		9	2	127	205	36	39	36	47	501
Diphtheria	2	25		21	3	1				52
Dysentery				3						3
Influenza		13			1	11			25	50
Measles	3	55	43	413	1,433	74	106	72	408	2,607
Mumps				243	162	19	25	10	8	467
Pneumonia	4	7			13				5	29
Poliomyelitis				1						1
Scarlet fever		22	11	72	138	6	9	10	8	276
Smallpox							1			1
Tuberculosis	3	4	3	66	34	20	5	1		136
Typhoid and paratyphoid fever				8	3				4	15
Whooping cough				70	142	1	7	7	21	248

CUBA

Habana—Communicable diseases—4 weeks ended May 3, 1941.—During the 4 weeks ended May 3, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths
Diphtheria	30	2
Tuberculosis		1
Typhoid fever	33	5

Provinces—Notifiable diseases—4 weeks ended April 26, 1941.—During the 4 weeks ended April 26, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana[1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1	1	2	7	2	11	24
Chickenpox	1	4	4	8	1	13	31
Diphtheria	1	39				3	43
Hookworm disease		28					28
Leprosy						3	3
Malaria	7	2		12	3	65	89
Measles	1	4	22	5	2	1	35
Poliomyelitis						1	1
Scarlet fever		1				1	2
Tuberculosis	23	29	13	41	8	41	155
Typhoid fever	19	73	9	14	5	26	146
Yaws						2	2

[1] The city of Habana is also included.

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended December 28, 1940.—During the 13 weeks ended December 28, 1940, cases of certain infectious diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	17,015	Puerperal pyrexia	1,590
Dysentery	1,135	Scarlet fever	22,351
Ophthalmia neonatorum	934	Typhoid and paratyphoid fever	430
Pneumonia	9,576		

England and Wales—Vital statistics—Fourth quarter 1940.—The following vital statistics for the fourth quarter of 1940 for England and Wales are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar-General and are provisional:

	Number	Annual rate per 1,000 population		Number	Annual rate per 1,000 population
Live births	137,009	13.1	Deaths from—Continued		
Stillbirths	5,127	.49	Influenza		0.08
Deaths, all causes	141,598	14.2	Measles		0.04
Deaths under 1 year of age	7,765	[1] 57	Scarlet fever		0.00
Deaths from:			Typhoid and paratyphoid fever		0.00
Diarrhea and enteritis (under 2 years of age)		5.6	Whooping cough		0.03
Diphtheria		0.09			

[1] Per 1,000 live births.

NOTE.—The above deaths include civilians only.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-February 1941	March 1941	April 1941—week ended—			
				5	12	19	26
ASIA							
China: Hong Kong	C	18	549	49	20		
India:							
Calcutta	C	538	176				
Rangoon	C	13					

PLAGUE

[C indicates cases, D, deaths]

Place		January-February 1941	March 1941	5	12	19	26
AFRICA							
Belgian Congo	C	1					
British East Africa:							
Kenya	C	8	2				
Uganda	C	28	1				
Madagascar	C	103	69				[1] 11
Morocco	C	375	242	38	35	55	53
Tunisia: Tunis	C	2					
Union of South Africa	C	13	4				
ASIA							
Dutch East Indies							
Java and Madura	C	158					
West Java	C	88					
India:							
Calcutta	C		3				
Rangoon	C	2					
Thailand: Lampang Province	C			1			
SOUTH AMERICA							
Argentina: Cordoba Province	C	1					
Peru:							
Lambayeque Department	C	1	1				
Libertad Department	C	5	1				
Lima Department	C	2	3				
OCEANIA							
Hawaii Territory: Plague-infected rats		6	3		1		
New Caledonia	C	7					

[1] For the month of April.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Con.

SMALLPOX

[C indicates cases; D, deaths]

Place		January-February 1941	March 1941	April 1941—week ended—			
				5	12	19	26
AFRICA							
Algeria	C	38	41			14	
British East Africa	C	7					
Dahomey	C	270	81				
French Guinea	C	11	9		3		
Ivory Coast	C	15	6				
Morocco	C	27		4			
Nigeria	C	83	187				
Niger Territory	C	52	72				
Portuguese East Africa	C	9					
Rhodesia: Southern	C	62	18				
Senegal	C	18	12				
Sudan (Anglo-Egyptian)	C	1	4	2			
Sudan (French)	C	10	4			3	
ASIA							
China	C	89	25	5	7	3	
Chosen	C	[1] 207					
India	C	4,682					
Indochina (French)	C	196	129				[2] 180
Iran	C	4					
Iraq	C	621	137				
Japan	C	80	12				
Syria	C		1				
Thailand	C	70	5	8	1		7
EUROPE							
France	C	1					
Portugal	C	9	3		1	3	2
Spain	C	95	2				
NORTH AMERICA							
Canada	C	1	2	6		3	1
Cuba	C			1			
Dominican Republic	C		2				
Guatemala	C	3					
Mexico	C	18					
SOUTH AMERICA							
Colombia	C	127	3			3	
Uruguay	C	[1] 7					
Venezuela (alastrim)	C	34	13				

[1] For the month of January.
[2] For the month of April.

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January-February 1941	March 1941	April 1941—week ended 5	12	19	26
AFRICA							
Algeria	C	807	741				
Egypt	C	26	6				
Morocco	C	29	110	24	21	26	31
Sierra Leone	C	3	1				
Tunisia	C	382	612	223	170	141	178
Union of South Africa	C	11	1				
ASIA							
China	C	33	24	8	9		
Chosen	C	[1] 5					
Iran	C	[1] 11	40				
Iraq	C	5	4				
Japan	C		1				
Straits Settlements	C	2					

See footnotes at end of table.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Con.

TYPHUS FEVER—Continued

[C indicates cases; D, deaths]

Place		January-February 1941	March 1941	April 1941—week ended—			
				5	12	19	26
EUROPE							
Bulgaria	C	39	32			9	
Germany	C	209	146	6	63		
Greece	C	7					
Hungary	C	40	51	3		12	30
Irish Free State	C	3	4				
Poland	C		[2] 77				
Rumania	C	337	102	12	23	2	
Spain	C				[3] 968		
Switzerland	C		2				
Turkey	C	[1] 91					
Yugoslavia	C	76					
NORTH AMERICA							
Guatemala	C	62	20				
Mexico	C	3	2		2		
Panama Canal Zone	C	1	2				
SOUTH AMERICA							
Chile	C	8	2				
Ecuador	C	21	8				
Venezuela	C	17	2				
OCEANIA							
Australia	C	3	3				
Hawaii Territory	C	2	1	7			

[1] For the month of January.
[2] For 2 weeks.
[3] For the period Jan. 26 to Apr. 12, 1941.

YELLOW FEVER

[C indicates cases; D, deaths]

AFRICA							
French Equatorial Africa	C		2				
Gold Coast	C			1			
Ivory Coast	C	[1] 3					
Spanish Guinea.[2]							
SOUTH AMERICA [3]							
Colombia:							
Antioquia Department	D	1					
Boyaca Department	D	3			1		
Intendencia of Meta	D	1					
Santander Department	D	2					
Tolima Department	D	1					

[1] Includes 2 suspected cases.
[2] For the week ended May 3, 1941, 4 deaths from yellow fever were reported in Kogo, Spanish Guinea.
[3] All yellow fever reported in South America is jungle type unless otherwise specified.

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Public Health Reports

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IN THIS ISSUE

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FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

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Public Health Reports

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

April 20–May 17, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended May 17, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—The number of reported cases of influenza dropped from approximately 17,700 cases during the preceding 4-week period to 7,530 cases for the current 4-week period, but the current incidence was about 40 percent in excess of the incidence for the corresponding period in 1940, and also of the 1936–40 median figure, which is represented by the 1940 incidence (5,650 cases). The disease is still unusually prevalent in the South Atlantic, West South Central, and Pacific regions, with a slight increase over the seasonal expectancy in the Mountain region. All other regions except the Middle Atlantic reported a relatively low incidence.

Measles.—While the number of reported cases of measles dropped from approximately 219,000 for the 4 weeks ended April 19 to 172,184 for the 4 weeks ended May 17, the incidence was still the highest on record. The nearest approach to the current figure was in 1935 when the cases for this period totaled approximately 129,000. In 1934 and 1938, other years in which measles was epidemic, the cases totaled approximately 125,000 and 115,000 cases, respectively. The highest incidence was reported from the Middle Atlantic, East North Central, and South Atlantic regions, but every region except the Pacific reported a very significant increase over the 1936–40 median figure for

this period. For the country as a whole the number of cases was more than 3 times the seasonal expectancy, while the excesses in the various regions ranged from 1.3 times the median in the Mountain region to almost 8 times the median in the East North Central region.

Poliomyelitis.—For the current period there were 76 cases of poliomyelitis reported, as compared with 66, 149, and 64 cases for the corresponding period in 1940, 1939, and 1938, respectively. The incidence was slightly above the average seasonal incidence and each region except the New England, West North Central, and Pacific contributed to the excess. While the number of cases in each region showing an increase was small, it represents approximately a 50 percent increase over the 1936–40 median incidence for the region.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period Apr. 20–May 17, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	856	927	1,486	7,530	5,650	5,650	172,184	44,682	52,581
New England	26	26	46	14	12	21	6,623	5,193	5,193
Middle Atlantic	140	187	301	81	88	81	54,701	8,123	19,039
East North Central	157	144	288	301	444	482	52,497	6,619	6,619
West North Central	77	84	102	118	71	251	7,336	4,077	4,077
South Atlantic	147	152	208	2,751	2,012	1,335	27,077	2,817	6,126
East South Central	68	58	95	343	517	664	9,174	1,559	1,559
West South Central	119	159	181	2,701	1,792	1,842	7,589	5,873	3,656
Mountain	58	50	50	476	453	414	4,324	4,054	3,412
Pacific	64	67	114	745	261	376	2,863	6,367	6,367
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	181	171	233	76	66	66	13,832	19,830	19,830
New England	11	9	11	0	1	1	1,206	1,195	1,358
Middle Atlantic	38	48	48	8	7	6	4,590	7,653	6,574
East North Central	22	11	31	12	7	8	4,189	7,004	7,004
West North Central	9	14	19	1	5	3	1,141	1,106	2,437
South Atlantic	45	28	47	16	8	12	718	819	767
East South Central	32	32	52	11	5	7	714	638	277
West South Central	14	19	23	11	6	8	337	207	426
Mountain	2	5	7	5	5	3	335	437	469
Pacific	8	5	11	12	22	14	602	771	1,014
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	218	280	1,142	377	415	521	21,484	14,357	[3] 14,769
New England	0	0	0	27	29	20	1,605	1,081	1,351
Middle Atlantic	0	0	0	56	80	71	3,100	2,896	3,607
East North Central	59	35	226	38	75	75	4,175	2,612	2,990
West North Central	84	107	463	14	19	23	1,749	573	573
South Atlantic	10	7	5	91	58	101	3,225	1,573	2,357
East South Central	15	28	28	55	48	54	836	673	673
West South Central	14	51	61	53	57	119	1,661	1,623	1,623
Mountain	8	32	128	18	21	30	1,543	1,223	926
Pacific	28	20	143	25	28	42	3,590	2,103	2,103

[1] Mississippi, New York and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] 3-year (1938–40) median.

Whooping cough.—The number of cases (21,484) of whooping cough was approximately 50 percent in excess of last year's figure for this period and also of the 1938–40 average incidence for the period. Each section of the country contributed to the excess except the Middle Atlantic; in that region the incidence was relatively low.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The incidence of diphtheria continued at a relatively low level, the number of cases (856) reported for the 4 weeks ended May 17 being about 90 percent of the number reported for the corresponding period in 1940, and less than 60 percent of the 1936–40 median incidence for this period. The situation was favorable in all sections of the country.

Meningococcus meningitis.—For the 4 weeks ended May 17 there were 181 cases of meningococcus meningitis reported, as compared with 171, 154, and 233 cases for the corresponding period in 1940, 1939, and 1938, respectively. While the incidence was slightly higher than in each of the 2 preceding years, it was only about 80 percent of the average incidence for this period. The East North Central and South Atlantic regions reported considerable increases over 1940, but in the East North Central region the incidence was below the seasonal expectancy and in the South Atlantic region the number of cases closely approximated the 1936–40 median figure for this period.

Scarlet fever.—The number of cases (13,832) of scarlet fever reported for the current period is the lowest reported for this period in the 13 years for which these data are available. The incidence was about 70 percent of that reported for the corresponding period in 1940, which figure (19,830 cases) also represents the 1936–40 median figure for this period. In the East South Central region the number of cases (714) was more than two and one-half times the average incidence for this period, but in all other regions the incidence was relatively low. Very significant decreases were reported from the Middle Atlantic and North Central regions where the incidence is normally quite high at this season of the year.

Smallpox.—The incidence of smallpox was also relatively low. The number of cases (218) reported for the current 4-week period was about 80 percent of the number reported in 1940, and only about 20 percent of the 1936–40 median figure for this period. Since smallpox was unusually prevalent in the years 1937–39, inclusive, the median falls within that period, while for the more normal years of 1933–36, inclusive, the average incidence for this period was approximately 750 cases, thus further emphasizing the current low incidence of this disease.

Typhoid and paratyphoid fever.—The incidence of this disease was favorable in practically all sections of the country. The 377 cases reported for the current period represented a new low level for this season of the year, the figure being only about 90 percent of last year's low level and about 70 percent of the preceding 5-year average incidence. In the New England region a few more cases than might be expected were reported and in the East South Central region the incidence stood approximately at the normal seasonal level, but in all other regions the incidence was relatively low.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended May 17, based on data received from the Bureau of the Census, was 11.3 per 1,000 population (annual basis). The current rate is slightly below the 1938–40 average rate of 11.7 per 1,000 population.

STATE AND TERRITORIAL HEALTH OFFICERS CONFER ON HEALTH DEFENSES

The State and Territorial Health Officers met, as is their yearly custom, in conference with the United States Public Health Service on April 29, 1941. The alarming nature of events in the Eastern Hemisphere turned this 39th annual conference between these two groups into a council on health as a factor in national preparations for defense. A number of Provincial health officers of Canada were present as guests of the Conference. The Selective Service System sent representatives to the meeting, as did the Army, the Navy, and other branches of the Federal Government, as well as certain nongovernmental organizations interested in medicine and public health.

Surgeon General Thomas Parran in calling the meeting to order reported results on the recommendations made by this Conference at its extraordinary session on September 16 and 17, 1940. Under the Selective Service process, all persons are given routine serological tests when they are examined by their local draft boards. All communicable diseases, including tuberculosis and the venereal diseases, disclosed by examinations under Selective Service are required to be reported. Additional funds have been secured to reinforce State and local facilities for public health activities to meet conditions produced by the emergency. A bill pending before the Congress provides substantial appropriations for public health facilities in critical areas. It is anticipated that some action will be taken by the Selective Service System to recognize the work of official public health agencies as an essential part of the program of national defense.

The Surgeon General brought to the health officers of the United States and of Canada personal greetings from their colleagues in England. In place of his accustomed annual summary of public health affairs in the United States, he talked of medicine and public health in England. The text of his remarks follows:

Modern science has extended the area and scope of medical defense against enemy action no less than it has extended the area and scope of war operations. The whole population of Great Britain is in the battle line. The whole medical profession is in the forefront of the battle. As a member of a Commission on Civil Defense, I spent the month of February in Great Britain. This commission was appointed by the Council of National Defense at the request of the General Staff of the Army. Military science has evolved through the centuries, engaging some of the best minds in every country in every age. In Great Britain during the past few years, there has been developed a new science of civil defense just as intricate, just as complicated in its organization and operation as military science. Yet there have been few guideposts, no trained personnel. It is commonly agreed that the system, especially in its medical aspects, accomplishes its purpose through an integration of governmental, professional, and voluntary effort.

In planning civil defense measures, the British made two major mistakes: (1) They assumed widespread and intensive raids immediately at the outset of the war with as many as 30,000 casualties a day needing hospital care. (2) They did not envision prolonged continuous night bombing necessitating the use of shelters as sleeping quarters.

To care for the expected casualties, they doubled the prewar complement of hospital beds throughout the country, by discharging convalescent patients, by evacuating mental hospitals, institutions for the feeble-minded, the aged, etc., by constructing huts, temporary wards frequently on the grounds of an existing hospital, by converting large estates into hospitals, and by "upgrading" existing institutions through the addition of operating theaters, the provision of nursing and surgical staffs, and the like.

In preparation for war, the country was divided into twelve regions with a regional commissioner in charge and with representatives of each Ministry assigned to the commissioner. This decentralization of government was designed to provide independent self-governing areas in the event of invasion or other enemy action which would disrupt communications. The public health, hospital, and medical services are a part of the regional plan. The war has brought large responsibilities to the Ministry of Health and to local health authorities. Under the Ministry, an Emergency Medical Service was organized. An important first step was a cataloguing of all hospitals in the country, voluntary and public. The use to which each should be put was decided. The London area was recognized as a special case and its emergency hospital service was based upon ten sectors radiating fan-like from the center outward and extending well beyond the metropolitan area. In each sector the hospitals are classified into Casualty Clearing Hospitals, Advance Base Hospitals, and Base Hospitals, and additional beds provided for each. The Casualty Clearing Hospitals are near the center of London and other large cities. A large proportion of regular patients were evacuated, especially from the top floors and glass cubicles. In addition a specified number of beds in each are kept vacant for casualties.

The Advance Base Hospitals usually are located 15 to 30 miles from the center of the city. The average capacity is 1,000–2,000 beds. Patients are admitted to these hospitals from the Casualty Clearing Hospitals or occasionally directly from first-aid posts.

"Base Hospitals are located 60 to 100 miles out, 1,000–3,000 beds. Patients admitted to these have been classified into specialty groups, orthopedic, maxillo facial, neurosurgical, eye, etc.

The Emergency Medical Service pays the voluntary hospitals £3 per week per bed reserved for casualties. When occupied, the rate is £4 per week. Due to the lack of casualties, this has proven a boon to the voluntary hospital budgets. It should be emphasized that there is in Great Britain now essentially one integrated national hospital service for civilian and military casualties. There are no separate base hospitals for the Army. Since this whole system has been scrambled together, the British doubt that it ever will be completely unscrambled.

The first-aid posts were organized by the municipal or county health authorities under standards proposed by the ministry. In general the cost of ambulances and of the whole air-raid precaution service is reimbursed by the central government. To train the first-aid teams has been a major task. The need for additional nurses has been met by training more than 120,000 nursing aides and auxiliaries.

While total war creates a demand for many skills, the skill in which there is the greatest shortage is that of the doctor. Last week the President responded to the urgent request of the British Red Cross for American doctors. He said: "To any American doctor who is eligible and able to do service this cause presents a splendid opportunity." Assurance that medical aid is promptly available to all casualties is an important consideration in maintaining morale. Day and night in every operating theater, a surgical team stands by. A doctor is on call or working in every first-aid post. Each night a doctor visits all large shelters. Moreover a modern army requires many doctors, especially in mobile mechanized warfare. Doctors are needed too in the large factories and to supply the needs of an expanded Navy and Air Corps. Up to now epidemics have been held in check. Air-raid casualties have been fewer than anticipated and have received prompt attention. To accomplish these results, however, the British doctors have been under a severe strain and medical services for the general population have been diluted. Britain's appeal to the American Red Cross for at least 1,000 of our young doctors is a great opportunity for us to meet a real need. Aside from its humane aspects, American doctors, working side by side with British surgeons and physicians, will acquire valuable experience in the medical techniques of modern warfare. Those who answer this Red Cross appeal will not only have rare professional opportunities but will also have the satisfaction of giving help where it is sorely needed. I feel certain America's doctors will answer this call. The needs are great; the rewards will be greater.

The British have been very intelligent in using their medical resources to the best advantage. No medical or dental student is allowed to volunteer and he is not drafted if he passes his examinations from term to term in an accredited school. This deferment is not a "hiding hole" for slackers. Every such student upon graduation or after one or two 6-month periods of interneship is automatically called to service for the duration.

When the system of the Emergency Medical Service Hospitals was established, they were staffed by doctors of all ages who were, in effect, requisitioned from civil practice. In London, for example, the staffs of the teaching hospitals located near the center of the city were dispersed to the peripheral hospitals. The regional, sector, and group hospital officers who themselves had been drawn largely from the staffs of voluntary hospitals, decided who would go to the peripheral base hospitals and who would stay at home. With rare exceptions the assignments were considered as orders. For example, a large proportion of the specialists in Harley Street, with expensive practices and equally expensive offices and other commitments, were recruited for full-time service at a standard pay of £800 per

year. They abandoned their practices, moved 50 to 100 miles to a base hospital and stood by waiting for patients. No casualties appeared during the early months of the war. Naturally some of them drifted back to their accustomed practice. Recognizing the situation, the Emergency Medical Service gave these doctors the choice of continuing on a full-time basis or of rendering a part-time service, subject to call at a lower pay (£300 per year) but with the understanding that if enemy action increased and the government required their services full-time, such services would be given at the same part-time rate. Most of the doctors accepted the offers, leaving skeleton staffs, mostly junior men, at the peripheral hospitals. When the heavy blitz started in September 1940, the full-time service of additional doctors was required in the peripheral hospitals and the financial arrangement was readjusted.

Prior to the war there was perfected a medical war organization for the country. At the head was a Central Medical War Committee, composed of the leading physicians, members of the British Medical Association. The Secretary of the Committee is the Secretary of the British Medical Association. To this committee was given the task of registering every doctor and every medical student in the country.

Whenever the military forces requisition a quota of doctors, the Central Medical War Committee allocates the quota to the various communities in Great Britain in proportion to the number of doctors still remaining as related to the population. When the quota is sent to the civil subdivision (county, city, etc.) a local medical war committee, made up of senior doctors, selects the persons who can most easily be spared from present tasks. Doctors in health departments and in important hospital positions are not disturbed. Younger doctors are given preference for service. When a doctor is selected by the local medical war committee he responds in nine cases out of ten. The exceptional doctor may ask for deferment because of some determining personal consideration. His appeal is reviewed. If the decision is not in his favor, he has the right of appeal officially to the Central War Committee in London. Ordinarily, financial considerations are given scant attention.

If we are to learn anything from the British experience on the medical front, we must reorganize our approach to the problem of medicine's contribution to the defense effort. The medical needs of the civilian population should be considered in all recruitment plans, and should be balanced against the military needs. The Health and Medical Committee, under Coordinator McNutt, or a comparable group should be given responsibility for broad national planning. Medical personnel for military, industrial, and civilian health and medical services should be recruited on a quota basis, having in mind the service which each individual physician can render best. Volunteers should not be accepted if they are doing a more essential civilian job. The objective should be to see that each doctor is doing the task for which he is best fitted.

Under a national medical committee, there should be similar committees on medical personnel in each State and in each of the larger communities. These State and local committees made up of senior doctors should decide who should join the services and who should remain at home.

All medical and dental students enrolled, all students accepted for admission and those completing their courses satisfactorily in accredited medical and dental schools should not be drafted until graduation and the completion of an interneship, after which those who are physically fit should be required to render a period of service to the government.

The successful local organization of medical defense efforts in Great Britain was possible because, for two decades or more, Britain has had a nucleus of trained medical officers of health. Without this nucleus, effective local medical

defenses could not have been organized. We should take steps promptly to double the number of doctors with training and experience in public health and medical administration. In addition, there should be a comparable increase in public health nurses, sanitary engineers, sanitary inspectors, laboratory technicians, and other technical public health personnel. New training centers will be needed for the training of key persons who in turn will train others who will work under supervision in local communities.

Central planning for medical aspects of civil defense should be done. This should include the survey of existing hospital facilities, area by area, and of those structures which can be converted to hospital use. Estimates should be made as to additional hospital beds needed, area by area. The number and location of the beds will depend upon the position of the area in reference to vulnerability to enemy action.

Time does not permit a comprehensive outline of all needed steps. Some of the factors, however, should include provision of additional operating theaters and their protection against enemy action, the protection of existing hospitals, the consideration of safety from air attack in new hospital construction, the number, location, and equipment of first-aid posts, the provision of ambulances of a standard type with standard fittings, and the earmarking of commercial vehicles for emergency ambulance service, the planning of decontamination centers and training of key personnel in each vulnerable area in antigas warfare. I am not recommending all of the above for the whole country but for those areas designated by competent military authorities as vulnerable to enemy action. In addition, special mobile staffs trained in medical defense measures should be available to aid in the organization of such measures in our territories and possessions and in those areas which we are committed to defend.

It should be emphasized that, in the midst of war, the British have not curtailed but have extended their social insurance and other social laws.

Finally, let me say that we (doctors) in the United States should be inspired by the example of our British medical colleagues. In the midst of war they are planning for the peace. The British Medical Association has set up a Medical Planning Commission to "study war-time developments and their effects on the country's medical services, both present and future." In an editorial comment the British Medical Journal points out that the war has thrown into sharp relief the deficiencies of their peace-time system of administering relief to the sick and of promoting and maintaining the health of the people. "The British Medical Association now proposes to prepare for the return of peace so that medicine may be ready to meet its responsibilities in a world in which many values will be changed, fresh conceptions of society will be formed, and in which new stresses and strains will appear in the moral, material, and economic fabric of the democracy we hold to be our rightful heritage."

I have every confidence that medicine in America will meet whatever demands the future may impose, whether of war or peace.

SPECIAL PROBLEMS IN HEALTH DEFENSES

On July 1, 1939, the Public Health Service became a part of the new Federal Security Agency, which was formed to bring the Federal organizations carrying on activities in health into one general fold. Paul V. McNutt, Administrator of the Federal Security Agency, greeted the members of the Conference. He informed them that in surveying the public health problems of the country from his unique

vantage point he would name three which, particularly in this time of crisis, should have the full attention of the health authorities of the Nation. The work of industrial hygiene must be one of their main concerns as industry expands and takes on not only more workers but untried workers. New knowledge in nutrition points the way to a successful program of nutrition, and such a program is highly necessary to our national endurance. The old problem of medical care for those who cannot procure it for themselves takes on urgency as populations shift and people are caught in new surroundings by misfortunes in health.

Mr. McNutt's remarks to the Conference were printed in full in the May 9, 1941, issue of the Public Health Reports.

The remaining formal addresses scheduled for the Conference covered these subjects:

(1) Activities of the Health and Medical Committee of the Federal Security Agency.

(2) Pending Federal health legislation.

(3) Coordination of health, welfare, and related activities in national defense.

(4) Medical problems in the administration of the Selective Service Act.

(5) Community health services and facilities.

(6) Industrial hygiene.

(7) Venereal disease control.

ACTIVITIES OF THE HEALTH AND MEDICAL COMMITTEE OF THE FEDERAL SECURITY AGENCY

Dr. James A. Crabtree, of the United States Public Health Service, appeared before the Conference as executive secretary of the Health and Medical Committee of the Federal Security Agency to give an account of its activities. The European scene, he informed the members, is bringing out in bold relief the importance of physical fitness, mental alertness, adequate nutrition, industrial hygiene, aviation medicine, and public health.

Six subcommittees within the Health and Medical Committee have been set up to represent broad segments of professional and community interests within the field of health—hospitals, medical education, dentistry, industrial health and medicine, nursing, and Negro health.

The hospital problem is one of maintaining some reasonable balance between facilities for the military and those for the civilian population. One of the most important considerations has been the deferment of internes from military duty until they have completed their interneship. The Federal agencies having any administrative responsibility

bearing upon such persons are agreed that an uninterrupted supply of medically trained graduates must be maintained to meet the increasing needs, both military and civil, of the country.

Negotiations are under way to obtain a priority status for civil hospitals so that they may purchase essential supplies, more particularly surgical equipment.

Legislation pending before the Congress will provide, if passed, direct Federal assistance to the defense communities most greatly in need. Such assistance will include provision of hospital facilities in critical defense areas where the great influx of people will seriously overburden existing hospitals, if any, in fact, do exist.

The Committee has been making recommendations and promoting action to resolve the problems of industrial health and medicine which are being multiplied by expanding industrial activity. It will be necessary to train large numbers of professional and technical personnel in industrial medicine, hygiene, and nursing. The work of the United States Public Health Service in industrial hygiene must be expanded. It is of particular interest to the national defense to safeguard the health of workers employed in the industrial establishments of the Army and Navy. Many of the newer industrial processes necessitate wider research.

The Public Health Service has placed five teams, and there will be more soon, at the service of State and local health agencies to help resolve their problems of industrial health. Each of these teams consists of a specially trained physician, an engineer, and a chemist, with additional personnel as required.

Industrial nursing is being given a place, long overdue, in the program of industrial hygiene.

To provide a roster of nurses for present and future needs, an inventory of all the Nation's registered nurses is being taken. It is hoped that refresher courses may be arranged for those nurses who have not recently been engaged in their profession.

A circumstance that must be taken into account is that from 30 to 40 percent of American male citizens, otherwise available for military duty, are being found unacceptable because of physical defects, many of which are remediable. A special commission has been created by the Health and Medical Committee to investigate in the light of these findings the present provision and distribution of medical service facilities.

An important field of knowledge in times like these is that of military medicine and hygiene. Research is being directed especially into the fields of aviation medicine and physiology, neuropsychiatry, chemotherapy, tropical diseases, nutrition, industrial toxicology, and the several specialties of medicine and surgery.

The problem of nutrition is different from that of 1917. In those days the Food Administration set up by the Government was concerned with restricting the use of such commodities as wheat, sugar, and fats. Today we have substantial stocks of all essential foods. Research into food values has almost completely transformed our knowledge of nutrition. These two circumstances give us a start on our task of improving the nutrition of the American citizen and at the same time supplying Britain and the allies with the kind and quantity of food they need.

Mobilization and the expansion of industry have so increased the population in many communities that acute problems in health, housing, sanitation, and medical and hospital service have arisen to plague the authorities. The Public Health Service has assigned a Senior Medical Officer to each of the nine Army corps areas to help coordinate the relationship between the civil and the military and facilitate the solution of health problems common to both. Additional Public Health Service personnel are being recruited and trained for assignment to the more critical areas.

The problems in question are essentially local or regional; they are not unique in character; and their resolution is largely a responsibility of the country's health officers.

PENDING FEDERAL HEALTH LEGISLATION

Assistant Surgeon General E. R. Coffey enumerated for the Conference pending legislation bearing on public health. Of the 6,061 bills and joint resolutions introduced before the Seventy-seventh Congress between January 3 and April 21, 1941, 56 pertain to public health matters. Some of these are of minor or local interest. A number are of great importance to the conduct of public health in meeting the exigencies of defense.

Up to the time of the Conference the Seventy-seventh Congress had enacted one health measure. H. R. 3204 is the appropriation act providing $525,000 to enable the Public Health Service to assist the State and local health authorities in health and sanitation activities related to the national health program.

H. R. 3570 (S. 1375 is a companion or similar bill) provides for an appropriation of $150,000,000 to assist local communities in establishing essential facilities where the need has arisen incident to the national defense program.

H. R. 2475 prohibits prostitution within reasonable distance (as determined by the Secretaries of War and Navy) of military and/or naval establishments. This bill passed the House on April 21, 1941, and was referred to the Senate.

H. R. 4000 and S. 860 provide for control of the sale of alcoholic liquors to the members of the land and naval forces and the suppression of vice in the vicinity of military camps.

S. 509 provides for the general welfare by enabling the several States to make more adequate provision for the control and prevention of industrial conditions hazardous to the health of employees. It provides an initial appropriation of $1,000,000 to be administered by the Secretary of Labor for assistance to industrial hygiene programs in the States under the supervision of the State departments of labor.

S. 193 provides for compensation for disability or death of workers from silicosis or other dust diseases. These activities are also to be under the administration of the Secretary of Labor.

S. 783 provides for an amendment to the Selective Training and Service Act whereby graduates of medical and dental schools, in lieu of induction into the land or naval forces of the United States for training and service, shall be commissioned as officers in the Medical Department Reserve Officers' Corps and ordered into active military service of the United States. It provides further that medical students, dental students, hospital internes, resident physicians, and teachers in medical and dental schools shall not be ordered to active duty except in time of war.

S. 1375 (introduced April 25, 1941) provides for certain community facilities made necessary by the exigencies of national defense.

COORDINATION OF HEALTH, WELFARE, AND RELATED ACTIVITIES IN NATIONAL DEFENSE

Charles P. Taft, Assistant Coordinator of Health, Welfare, and Related Activities, discussed this work.

The activities fall into six major fields, the first of which is health. In the field of health this organization works through the Public Health Service and the public health agencies of the States and localities, with the advisory assistance of the Health and Medical Committee and of medicine in general.

In activities relating to nutrition it works with the Department of Agriculture, with State nutrition committees, and with such local organizations as have been built up by these other agencies.

The field of family security represents quite generally the transient problem, which is being added to by families stranded in areas of defense industries. The Public Assistance Division of the Social Security Board is a coworker in these matters.

In education the most serious problem is being brought about by a displacement, in the course of which school facilities will be lacking for many children. It is fair to say that 150,000 will be affected by next fall. In the Norfolk area, for example, some 3,500 are now living

on Government property. They are either the children of enlisted personnel living on the post or belong to families in Government housing projects not on the tax duplicate.

Recreation is the fifth activity. The task here is to provide opportunities for the men to enjoy their leisure time. A field staff has been established which works to interest the local community or local recreation council in undertaking a program of recreation. Where the community lacks sufficient resources, the United Service Organizations will be called upon to help. This is made up of the Y. M. C. A., the Y. W. C. A., National Catholic Community Service, Jewish Welfare Board, Salvation Army, and Travelers' Aid.

The sixth field takes in the legal and protective services having to do primarily with the problem of venereal disease. In this field the Office of the Coordinator is determined to carry on an educational drive which will reduce the venereal disease rate by reducing the opportunity to contract the disease. Local officials will be asked to enforce to the full the local and State laws on prostitution, and an attempt will be made to build up public opinion for such enforcement.

The protective side of the program will be directed toward the juveniles. Detention houses will be maintained for the girls until arrangements can be made to send them back to their own communities or otherwise to take care of them. Every effort will be made to rehabilitate these delinquents. The Children's Bureau is giving close cooperation in this work.

MEDICAL PROBLEMS IN THE ADMINISTRATION OF THE SELECTIVE SERVICE ACT

This discussion was given by Lieutenant Colonel Richard H. Eanes of the Medical Division of the Selective Service System.

Findings from the Selective Service process show the venereal diseases to be first among the medical problems, as they have been during so many of the world's disturbances and wars. Syphilis has been one of the problems of the Selective Service System, particularly in the southern States. In one State, young Negro men with positive serologic reactions represent 29 percent of those examined, and this percentage varies to somewhat under 20 percent in the different southern States.

The time may not be far distant when it will be necessary to omit the requirement excluding men having positive serologic tests from the Army. If they are adequately treated and show none of the sequelae of syphilis, it is believed that they can do service. For those few dangerous cases that slip by and are inducted, a register of syphilitics can be established and adequate treatment completed.

Gonorrhea has been giving some trouble, but with the treatment now provided by chemotherapy it should be possible to reduce the incidence of this infection to a minimum.

Conferences were recently held in Montgomery, Alabama, and Richmond, Virginia, on the problems being presented to the Selective Service authorities by the venereal diseases. It was proposed that a close liaison be maintained between the State health authorities and those carrying on the medical work of Selective Service and induction. The State health authorities would be informed almost immediately of any infections coming to the knowledge of the latter. When these plans are put into operation, the State authorities, working in some cases with the Public Health Service, will arrange, in accordance with the laws of the State, for treatment of the individual and further will try to seek out the source of his infection.

As to tuberculosis, the rejections to date are hardly as high as had been expected from the 1917–18 rate. It is too early, however, to quote figures on this disease.

Prehabilitation is a term used for the voluntary correction of remediable physical defects discovered in himself by a prospective selectee. If he is not able financially to do this himself, he should be referred to some public agency. An analysis of a group of I–B cases, subject to limited military service, indicated that the majority of them could be rehabilitated and rendered fit for Class I–A. The local board chairman could help along both prehabilitation and rehabilitation if he had a list of all health facilities in the vicinity available for this work. The State health officer could be responsible for this list so that the local boards might use it with assurance in advising selectees.

The supply of medical personnel is a subject of great interest. It is judged that 3,500 physicians fit for active military service will be needed each year for replacement in the Medical Corps of the Army. The Office of the Surgeon General of the Army estimates that the present pool of reserve officers fit for active military duty will be completely exhausted before the end of 1942. It will then be necessary to depend upon the medical graduates of 1941 and the succeeding years.

It goes without saying that the Surgeon General of the Army considers the initial year's interneship a part of the basic training of a doctor. Graduate students or young doctors who apply for a commission in the Medical Corps Reserve and meet the physical and other qualifications will be given a commission. They will be carried administratively in a War Department pool for their initial year of interneship and will not be called to active duty until that is completed.

According to the latest information available, the men summoned before the Selective Service local boards are being classified about as follows:

Class I–A, available for general military service, 68 percent of those who are being physically examined.

Class I–B, available for limited service, 12 percent.

Class IV–F, disqualified for any military service, 20 percent.

Of the 68 percent sent to the induction station, about 13 percent are being rejected as unfit for general military service. Usually the borderline cases are given limited service classification.

This means that approximately 40 percent of all men examined by Selective Service local boards are being rejected for general military service. About one-half of these, or 20 percent, are in the limited service classification, the major portion of whom have defects that are remediable.

Of the 32 percent who are rejected after physical examination by the Selective Service local boards, 18.6 percent are rejected for defects of the teeth, 10.6 percent for defects of the eyes, and 10.1 percent for cardiovascular defects. Of the 13 percent rejected at the induction stations, 19.3 percent are rejected because of defects of teeth, 13.3 percent because of eye conditions, and 10.5 percent because of mental and nervous defects.

The groups of defects of the eyes and teeth, hernia, and over- and under-weight account for a considerably higher proportion of the total number of defects in the limited service classification than in the disqualified classification.

The general discussion which followed these remarks by Lieutenant Colonel Eanes turned upon two classes of persons infected with the venereal diseases. One comprises those men with acute gonorrhea who are sent home on temporary deferment and told to report back when they are cured. Such men could spread the infection, and by becoming reinfected themselves stay out of service indefinitely. This contingency, Colonel Eanes informed the meeting, gave rise to the suggestion at the conferences in Montgomery and Richmond that the Selective Service officials report cases as quickly as possible to State and county health officers so that the men may be put under treatment with sulfathiazole.

The other group includes those men who are told to report back when they have had a negative serologic test and do so after 6, 8, or 10 weeks of treatment under the impression that they are cured. Colonel Eanes said that, in working on this problem, it is necessary to depend upon State health officers, county officers, and all doctors who have knowledge of the situation. It will be their duty to communicate what information they have to the Corps surgeons as quickly as possible.

COMMUNITY HEALTH SERVICES AND FACILITIES

Assistant Surgeon General Joseph W. Mountin, in opening this discussion, likened the problems of defense areas to those of boomtowns of former days. The elemental functions of health departments become paramount. They must provide sanitary facilities, safe water supplies, protection of food supplies, and other fundamentals that may be inadequate or entirely lacking. Law enforcement will be involved as distinct from educational visits of the nurse or inspector.

We lack at present some scheme of licensure with which to control the situation. The unsightly conditions that characterize so much of the mushroom development are only what we might expect in areas where there is no licensing of establishments. It is not unlikely that health departments will be obliged to operate facilities such as hospitals or health centers. Where the operator of the water plant or the sewerage plant is called away to military duty, an engineer from the health department may have to take over. This sort of thing happened in 1917.

Health departments are, unfortunately, restricted in legal authority. This lack stood out as a complication when the hospital bill was being considered last year. Very few States have established any authority to operate State and regional hospitals, and not infrequently cities and counties cannot combine to operate such facilities.

This same lack of authority will interfere with the development of water supplies in some of these unincorporated areas.

The appropriation of $525,000 made available for the period from March 1 to June 30 of this year is being devoted to this limited job of what is called emergency health and sanitation in defense areas. It is hoped that a corresponding $100,000 a month, or perhaps more, will be made available for the coming fiscal year.

It was largely on the suggestions of the health officers that the money has been employed in recruiting personnel and giving them a short period of orientation. These people are professionals—doctors, nurses, engineers, and laboratory workers. People below the professional grade should be employed with State and local funds. The new workers will be under the direction of State and local health officers, but will be paid by the Federal Government. The Government must retain the authority to reassign them to other areas in the event that acute needs develop in certain localities.

The cooperative partnership between the Federal and State governments will work out these medical and health aspects of national defense. Gradually, as the tax structure is built up in communities, a larger measure of community support will be expected. A considerable amount of cantonment pay rolls and industrial pay rolls will be spent in the local communities. This money should build up resources

to support community programs, some of which will conclude with the emergency, and others to be continued after it is over.

The discussion following Dr. Mountin's remarks had to do mainly with personnel. Two questions were posed. Would the Public Health Service in recruiting its new personnel take key persons away from State health departments? Could the health departments take the "next best" if that is what they had to do to meet their assignments?

Dr. Mountin answered that an effort is being made to use the money to recruit new people, that those in charge would do their best not to take people now employed in State or local health departments, but that they are obliged to take those who are on the rolls of the Federal Civil Service Commission. If a person is employed by a State and is on the Federal Civil Service roll, they cannot promise to assign him to the place of his present employment. Their plan has to be mobile to be successful.

With respect to the States' choice of personnel, Dr. Mountin said that it was hoped that they would adhere to the merit system and the qualifications set up by the State and Territorial health officers. Some leeway may be necessary in securing personnel under these unusual circumstances. It is hoped that the Committee on Personnel will pass a resolution to allow some leeway, to be used with caution and judgment and only to meet urgent conditions.

The other problem brought up in the discussion concerned water supplies and sewage disposal in those areas becoming thickly populated outside incorporated city limits. The Conference was informed that no money was available from present appropriated funds, but that the pending Community Facilities Bill provides funds that might be used for such facilities.

PROGRESS IN THE INDUSTRIAL HYGIENE PROGRAM IN NATIONAL DEFENSE

A discussion of this subject was presented by Dr. J. G. Townsend, Chief of the Division of Industrial Hygiene of the National Institute of Health.

He remarked that, although we know today how to control the majority of industrial health hazards, the application of that knowledge lags far behind. A large proportion of industrial workers have always worked under conditions unfavorable to health and well-being. Even in normal times, the loss of time due to all types of disabilities in industry amounts to the staggering total of 350,000,000 days a year, or considerably more than 1,000,000 work years annually. This burden must be reckoned with in any production schedule.

Problems of industrial hygiene will increase as industry expands. The new workers, many of them women, who replace those called

to military duty will be on the whole less able-bodied and less accustomed to an industrial environment. The problem of fatigue will be greater. Hazardous chemicals will be used without predetermination of their toxic nature. Crowding will beget loss of vigilance and an increase in accidents.

The Health and Medical Committee of the Federal Security Agency has appointed a Subcommittee on Industrial Health and Medicine. This subcommittee recommended that the Division of Industrial Hygiene of the National Institute of Health assume leadership in meeting the problems of this emergency. This Division has had more than 26 years of experience in research and related problems and has the personnel, the facilities, and the established relations with governmental and other agencies to carry on the work.

It is now entering into an even closer working relationship with the various State industrial hygiene units, the United States Department of Labor, the Council on Industrial Health of the American Medical Association, with other agencies both governmental and nongovernmental, with industry, and with labor itself. The program now being applied in each important industrial area is directed toward the following objectives:

1. The evaluation and control of the various health hazards resulting from exposure to dusts, fumes, gases, vapors, and other materials.

2. The provision of advisory services to industry in connection with the construction of new plants and the renovation of old plants, so that adequate facilities for health and safety may be included.

3. The promotion of physical examinations and medical services for the workers in order that the benefits of preventive and curative medicine may be applied promptly to their individual problems of health.

4. The control of communicable diseases among workers through a control program developed in connection with the general public health services of the community.

This program entails supplementing the facilities of State and local units by expansion of the services now provided by the Division of Industrial Hygiene. With funds recently made available by the Congress, the Division has put into the field mobile units, consisting of a physician and an engineer, to work in key defense industries in cooperation with the State departments of health.

Fundamental to the whole program is the research work in progress at the laboratories. Now under investigation are such substances as toluol, lead azide, solvents, metals used in airplane construction and munitions, and components of synthetic rubber and plastics. Standards for benzene, hydrogen sulfide, carbon disulfide, and carbon monoxide have been established. These standards define the amount

of toxic substances which may be permitted in the air of working places without harm to the workers.

The problems of aviation medicine constitute an important line of investigation. A study is being made of the efficiency and safety of oxygen administration apparatus at high altitudes and low temperatures.

These are only examples from the many activities with which the research section is concerned.

The resources of the Division are limited, and it is highly important that each State, especially those with large industrial populations, should direct all the funds it can spare into industrial hygiene activities. The industrial hygiene work is important, not just as an emergency program, but as an integral part of our national life.

PRESENT STATUS OF THE VENEREAL DISEASE CONTROL PROGRAM IN MOBILIZATION AND NATIONAL DEFENSE

Assistant Surgeon General R. A. Vonderlehr opened this discussion. He pointed out that the control of the venereal diseases has been affected in two ways since the beginning of the national defense program. The Selective Service System has made possible a much more exact determination of the prevalence of syphilis, and has brought a larger number of men infected with syphilis and gonorrhea under treatment than ever before in the United States. The second influence came from the instructions by the Congress that existing civilian facilities be intensified and adapted to the urgent new conditions.

Preliminary reports from 41 States and Territories show that among the first 950,000 men examined approximately 50,000 had positive tests. They also show that substantial numbers of men with the lesions of early syphilis and gonorrheal infections have been rejected by local Selective Service medical boards and Army induction boards.

Twenty States have reported on follow-up of selectees. Of selectees in these States, only 43 percent have been brought in for physical examination and less than 31 percent have been classified as under medical care for syphilis. No definite reports are yet available on the follow-up of men rejected for gonorrheal infections.

Venereal disease clinics throughout the Nation lack follow-up workers. At the beginning of the present fiscal year, according to reports from State health officers, at least one-half of the venereal disease clinics depended for contact-tracing and case-finding on part-time and untrained investigators, and two-thirds of the remaining clinics had no follow-up personnel. No clear-cut procedure has been instituted for referring back to Selective Service boards men who have been rendered noninfectious by adequate therapy. This

inadequate system is particularly unfortunate in gonorrheal deferments, for with modern chemotherapeutic treatment it should not be necessary to defer such selectees more than one month.

It is recommended that:

1. All selectees rejected because of such infection be followed up and given treatment. If possible, their contacts should be located and examined, and provided treatment where necessary.

2. Special investigators be assigned to study the results of all examinations and laboratory tests performed on selectees, to appraise the efficiency of the follow-up system, and to hold infected persons under treatment until rendered noninfectious.

3. A system be set up for referring back to Selective Service boards men originally deferred for syphilis and gonorrhea and subsequently rendered noninfectious by adequate treatment.

4. Sufficient trained personnel be provided to trace those supposedly infected civilian contacts of patients in the military personnel. This would be done through the cooperation of all military medical and civilian health authorities.

5. A program be instituted to apply the above methods and techniques to the control of syphilis and gonorrhea in industry and especially in the national defense industries.

6. An effective educational program be developed. This would be directed to informing the public and the armed forces as to the need for follow-up and for treatment, and also to discouraging those infected from seeking treatment from quacks or other unlicensed sources.

Evidence shows that late and late latent syphilis now receives more attention in public clinics than is justifiable from a public health standpoint. It is essential that everything possible be done to provide adequate medical treatment for early patients and to discourage the attendance of the others beyond the time when adequate treatment has been given. This idea should also guide the case-holding.

Facilities should be provided for the clinical management of gonorrhea in all venereal disease clinics throughout the United States. Almost 30 percent of the Nation's venereal disease clinics do not admit patients with gonorrhea.

Indications are that State and local health departments are distributing sulfonamide compounds which are outmoded. In spite of the proved efficacy of sulfathiazole for gonorrhea, only 200,000 tablets of this compound were reported purchased and distributed by State health departments during the first half of the present fiscal year, as compared with three and one-quarter million sulfanilamide tablets.

Facilities should be developed for the culture of the gonococcus in public laboratories, as the culture remains the most efficient method for the determination of cure in this disease.

Records should be kept on gonorrhea so that progress made from year to year may be determined and needs ascertained.

In the programs to control the venereal diseases, the educational and public relations techniques are exceedingly important. The Public Health Service is substantially increasing its venereal disease educational services to the States. Trained workers are available upon request who will collaborate on State and local activities. A matter for concern has been the quality of the educational materials put out by the States and the organization of programs.

Broad programs of public health education, utilizing materials produced by both Federal and State organizations, would benefit the general health and at the same time aid the control of the venereal diseases.

A measure of vital importance to the control of these diseases, with or without considerations of national defense, is the training of personnel, both old and new, who are otherwise qualified.

The discussion following these remarks brought out a question as to the reliability of serological tests. Dr. Vonderlehr replied that reliability of performance of serological tests for syphilis is rapidly increasing in the United States. Dr. Arthur McCormack, of Kentucky, rose to give credit to the Public Health Service for the improvement in the quality of serological tests resulting from the annual examinations given the laboratories.

COMMITTEE REPORTS

Committee on Hospital and Medical Care

The considerations of the Committee may be summarized by this question: What role will public health agencies play in the increasing governmental participation in hospital and medical care?

Some of the proposals now pending to provide Federal aid in defense areas in building and maintaining such facilities as hospitals, or in providing medical care to special groups, such as workers in defense industries, are certain to go into effect in the near future. It is believed that most State health departments do not have adequate authority to permit Federal agencies to allocate funds to them for reallocation to minor civil divisions for these purposes. In such cases, Federal agencies will be obliged to deal with other State agencies or directly with the localities concerned. This Committee last year drew the attention of the Conference to the need for "a single health agency charged with all governmental functions that are predominantly medical." In line with this statement and the foregoing considerations, the Committee adopted the following resolutions:

Resolved, **That this Conference strongly recommend that the expenditure of Federal funds for health facilities and medical care be administered by the Federal Security Agency.**

Resolved, That the provision of health facilities and medical care is an important interest of State health departments and that the Conference urge its members to secure for their departments the necessary authority, first, to construct and operate health facilities such as general hospitals, health centers, water supply, and sewerage systems, or to supervise their construction and operation by other State and local agencies; and second, to participate in programs of general medical care.

In view of the fact that some 40 percent of the men examined have been found physically unfit for full military service, the Committee wished to reiterate its resolution adopted by this Conference on September 17, 1940, and presented the following resolutions:

Resolved, That this Conference recommend to Congress that legislation be enacted which will permit the acceptance as beneficiaries by the United States Public Health Service of men examined under the Selective Service Act of 1940 and placed on deferred status because of correctible physical defects or ailments, and who make application to the Surgeon General of that Service, and that a suitable appropriation be provided for this purpose.

Resolved, That the Conference of State and Territorial Health Officers is much concerned by the health conditions revealed by the physical examinations made under the Selective Service Act and urges Federal and State health agencies to institute a program designed to prevent, or discover and treat defects and ailments among persons of both sexes now below draft or working age so that in the future persons reaching military or working age will be better equipped physically and psychologically to take their parts in civilian or military life.

Committee on Venereal Disease Control

This Committee submitted its report in five sections:

A Plan to Insure Adequate Venereal Disease Control Measures for Personnel Discharged from the United States Army, Navy, and Coast Guard

In spite of the most effective venereal disease control program which can be developed under existing conditions, it is certain that a considerable number of the men taken into and discharged from the Army under the Selective Service System during the next five years will be infected with the venereal diseases during their service period. A plan was drawn up by the Committee to insure adequate treatment of men infected with the venereal diseases in the military services and to prevent the transmission of such diseases by these men upon their return to civilian life. The six recommendations which constitute this plan are offered to the Secretary of War, the Secretary of the Navy, and the Federal Security Administrator.

1. A thorough physical examination to detect the venereal diseases, including a serologic blood test for syphilis and including also, if clinically indicated, necessary microscopic smears and culture examinations for the detection of the gonococcus, should be done on each man before his discharge from the military services.

2. The administration before discharge of a minimum of 20 doses of one of the trivalent antisyphilitic arsenical drugs and 20 doses of one of the heavy metals

by the medical corps of the respective military service to each man found to be infected with syphilis.

3. The administration before discharge from the military service of two grams of sulfathiazole per day for ten successive days to each man found to be infected with gonorrhea.

4. The adequate treatment before discharge of all men found to be infected with chancroid, granuloma inguinale, and lymphogranuloma inguinale to insure that such infected men are rendered incapable of transmitting their infections to others.

5. Before discharge from the military service of any man infected with the venereal diseases, the responsible medical corps should communicate with the health department of the State to which the infected man expects to proceed, to obtain from the State health officer assurance that free treatment facilities will be available at his new place of residence.

6. If no health department facilities for the free treatment of such infected man are available, the man should be retained by the respective medical corps until there is reasonable assurance that he has recovered from his infection.

Administrative Costs of the Venereal Disease Control Program

A careful study of administrative costs for venereal disease control work has been completed by the Public Health Service, at the request of the Congress, and a uniform plan drawn up to include provision of the following personnel and services:

1. A State Venereal Disease Control Officer. The travel allowance of such officer should not be included as an administrative item because, in most States, this officer performs some duties connected with field work.

2. A clerical assistant to the Venereal Disease Control Officer. The clerical assistant should perform those duties pertaining to the Venereal Disease Control Officer's correspondence, filing, or other general office work in this section of the health department.

3. Any other clerical or stenographic personnel at the State level, provided the major portion of their activities is concerned with general office work under the immediate supervision of the State Venereal Disease Control Officer. This item includes personnel concerned with the accounting of funds, but excludes personnel concerned with statistical activities, since the latter are included in the category of personnel performing duties connected with consultation and dissemination of technical information.

4. All activities concerned with the administration of the merit system on the State level.

5. A proportion of the items budgeted for office supplies and office equipment used primarily by personnel classified as administrative. These costs should be indicated in terms of the percentage of the total central office costs as well as in terms of an actual monetary figure.

This Committee recommended in general that the total cost of administering the venereal disease control program should not exceed five percent of all funds expended for this part of public health work in States with a population greater than one million and ten percent in States with a population of one million or less.

Proposed Revision of the Regulations Requiring Cooperation of Local Law Enforcement Authorities in the Repression of Prostitution Before Federal Funds Are Reallotted to Local Health Departments for the Control of the Venereal Diseases

Since a year ago, when members of the 38th Annual Conference of State and Territorial Health Officers recommended the repression of prostitution and defined the responsibility for the application of repressive measures, the problem of prostitution in the United States has become even more grave. In some areas where armed forces or national defense workers are concentrated, recent studies indicate the presence of prostitutes equivalent in number to one percent of the population. To encourage the repression of prostitution because of its public health importance and to inform public-spirited citizens of the incompatibility of tolerated prostitution and effective venereal disease control measures, the following revision of Section XV, paragraph 7, of the Regulations Governing the Allotment and Payment of Venereal Disease Control Funds is approved by this Committee and submitted with a recommendation that it be adopted by the members of the Conference:

7. In reallotting funds under this act for local venereal disease control services the State health officer shall give due consideration to the relatively higher prevalence of syphilis and gonorrhea in urban areas, provided that after conference with the local health officer the State health officer shall require from the agency of local government responsible for law enforcement against prostitution within the area a written statement that during the period when Federal funds are made available a program of repression of prostitution will be enforced. This statement from the director of the agency of the local government responsible for law enforcement against prostitution shall certify that during the life of a local venereal disease control budget, which includes Federal funds, such law enforcement authority will vigorously enforce all local and State laws prohibiting prostitution, procurement, solicitation, and assignation. Failure of the responsible authority to enforce such laws during the life of the venereal disease control budget will disqualify the local health department for further reallotments of Federal funds for venereal disease control work until satisfactory proof is produced by such local authority that said laws are actually being enforced.

Induction and Treatment of Selectees Infected with Gonorrhea

Whereas selectees called under the Selective Service Act and found to have uncomplicated gonorrheal urethritis are not accepted for induction into the United States Army; and

Whereas this policy results in turning back into the civilian population infected persons by whom the infection may be spread; and

Whereas modern methods of treating this disease result in prompt cures in a high proportion of cases: Therefore be it

Resolved, That it be the opinion of the members of this Conference that the objectives of the Selective Service Act and the health and welfare both of persons called for service thereunder who are found

infected with uncomplicated gonorrheal urethritis and of the civilian public could best be served if such selectees were promptly inducted into service and treated; and be it further

Resolved, That the members of this Conference recommend such action and that copies of this resolution be sent to the proper officials of the War Department and the Selective Service System.

Reciprocity Between States in Premarital Examinations to Detect Syphilis

A total of 24 States have enacted statutory provisions requiring premarital blood tests for syphilis. In 8 additional States similar provisions are pending. Compliance with such provisions should be as free from inconvenience to the general public as is consistent with the duty imposed.

Inconvenience at present is laid upon persons making application for marriage licenses in jurisdictions other than that of their residence. Reciprocity between States in premarital serologic examinations is definitely interdicted by the wording of the statutes in certain States. In others, especially in those in which the actual operation of the provisions of the law is placed under the guidance and supervision of the health departments, a program of full and free reciprocity would seem to be entirely feasible.

It is therefore recommended that full reciprocity be extended by the States in the matter of acceptance of premarital serologic reports in all instances in which the procedure is not specifically interdicted by the wording of the various statutes.

Reciprocity should also be furthered by the delegation of broad powers to State health departments in matters pertaining to the practical administration of the enactments of premarital legislation under advisement at this time.

Committee on the Social Security Program

Since the passage of the Social Security Act in 1935, this Committee has made from time to time recommendations for simplifying the procedures used in bringing the benefits of this Act to the people of the several States. As a result of its deliberations in this sixth year of the operation of the Act, the Committee reported back to the Conference:

Your Committee recommends the inclusion of items in budgets to pay expenses of individuals selected by the State health officer to attend such specified regional and national meetings as are approved by the Surgeon General.

It is recommended that the State health authorities in each State consider the establishment as soon as practicable of an adequate formula for the allotment of funds within each State.

It is recommended that no Social Security funds be used for the payment of salaries for State health officers after the next regular session of the legislature in each of the respective States.

It is recommended that the percentage of available appropriations allotted to each State be changed so that for "population" it will be 27.5 percent, for "special health problems" 45 percent, and for "financial needs" 27.5 percent.

It is recommended that there shall be included under "special health problems" a new sub-section (e):

> (e) National defense needs, including the environments of Army posts, cantonments and maneuver areas and defense industrial areas.

It is recommended that any unexpended balances from allotments to States under the present regulation for the current or subsequent fiscal year be reallocated under the new sub-section (e) of Section (2) for defense health needs.

Your Committee has considered the several addresses that have been made in regard to emergency health and sanitary problems arising from national defense needs, and it urges consideration by each State health authority of the adjustment of resources and program to defense needs, which are paramount.

The Committee recommends that the State health authorities confer with their respective Governors in regard to the problems of law enforcement, the passage of county and rural zoning laws and the passage of legislation providing sanitary control through permit or license by State or local health departments.

It is further recommended that each State health department arrange for a conference with other interested agencies in a planned development for a civil defense program, and that adjacent States prepare to pool their resources in the development of such a program.

Joint Committee on Professional Education and Qualifications of Public Health Personnel

During the past five years a nucleus of well-trained public health personnel has been developed which has contributed to the better organization of State, Provincial, and local health departments and to the extension of modern public health services into many new areas.

At the present time the recruiting of personnel for the national emergency, along with the continued necessity for safe-guarding nationally accepted standards of personnel qualifications adds to the problem of training public health personnel. The Committee in its discussions accented the value of the orientation or introductory program for public health personnel now being carried out by the United States Public Health Service. The Committee endorsed the act of university schools of public health in establishing special courses of training in industrial hygiene, venereal disease control, public health administration, and other specialized fields of public health practice.

The Committee reported that subcommittees had been appointed to confer with appropriate groups to set up standards of education and other qualifications for vital statisticians, public health educators, and public health laboratory personnel.

The Committee recommended that, when qualifications for these additional groups have been established, the United States Public

Health Service publish a special bulletin on the subject of training personnel under Title VI of the Social Security Act and under the Federal Venereal Disease Control Act.

The Committee, holding the principle of the merit system in high favor and wishing to safeguard standards during this emergency, suggested the desirability of establishing interim classifications with qualifications reasonably attainable under existing circumstances.

Committee on Records and Reports

This Committee has been working to simplify the system of reports within Federal and State governments. The work is still in the stage of study and investigation of forms now used and of the purposes which they serve and could serve.

In the meantime, the Committee recommended that the United States Public Health Service and the United States Children's Bureau be urged to make every reasonable effort to provide consultant service on records, reports, and correlated administrative practice to State health departments.

The Committee reaffirmed its previous recommendations regarding the elimination, simplification, and consolidation of activities, budgets, and financial report forms.

Committee on Interstate and Foreign Quarantine

The formal report from this Committee was not received in time to be included in this abstract of the proceedings of the Conference.

It is understood that the Committee discussed at some length plague suppressive measures, particularly as they bore upon the problem of national defense in the western States.

It is also understood that the Committee took up the problem of psittacosis, with the members agreeing that each State should adopt regulations against bringing in birds of the psittacine variety.

METHODS FOR CONTROLLING *AËDES AEGYPTI* MOSQUITOES WITH *GAMBUSIA HOLBROOKI* MINNOWS AT KEY WEST, FLORIDA

By JAMES H. LE VAN, *Passed Assistant Sanitary Engineer, United States Public Health Service*[1]

The climate of Key West, Monroe County, Fla., where the Aëdes Aegypti Control Unit of the Public Health Service was detailed from December 1938 to April 1939, is such that there is a year-round infestation of the domestic mosquito, *Aëdes aegypti*, the carrier of yellow fever and dengue fever. Unprotected and improperly pro-

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tected cisterns are the principal breeding places of *A. aegypti* and control of the mosquitoes presented the principal problem.

At the time of the present study the city had no public water supply. Most of the water is obtained by the collection of rainwater in cisterns, barrels, crocks, and other containers. Some drinking water is taken from shallow wells dug to a stratum of but slightly brackish water only a few feet below the ground surface. Water from this source is often used for other purposes to conserve rainwater so that it is not uncommon to find wells and cisterns on the same premises.

Although top-feeding *Gambusia* minnows had been used successfully in open containers in malaria control (*1*), and in yellow fever control in Tampico, Mexico, (*1*) and in Guayaquil, Ecuador, (*2*) a different situation existed in Key West than in most cities where these fish had been used. Experiments of others had shown that *Gambusia* fed mainly by attacking food while it is in motion. It had been concluded that these fish would be unable to see to feed if introduced into cisterns with almost no light in them.

The Unit began experiments with *Gambusia holbrooki*, the species found in five small fresh-water ponds on Stock Island adjacent to Key West. They were placed in one-half-gallon glass jars in a dark room and were fed *aegypti* larvae in total darkness. A faint red lamp was used to examine the results of feeding.

These experiments disclosed that the ability of *Gambusia* to eat larvae seemed to depend more on their appetite or capacity than on the amount of light present. In this series of experiments none of the minnows "ate themselves to death" in the presence of more than enough food, a statement that has been made about tropical fish used in *aegypti* control (*3*).

A brief test with *Mollienesia latipinna* indicated that darkness did not affect their ability to eat, but they are reputed to be mainly herbivorous, eating mosquito larvae only in the absence of plant food. Because of this characteristic they would be "virtually valueless as a destroyer of mosquito larvae" (*4*). Another reason for not using them is that they are highly susceptible to handling and chlorination injuries.

It was known that McCready of the Florida State Board of Health had placed small numbers of *Gambusia* in several of the Key West cisterns in 1935. Fish still were alive in many of these cisterns that were examined by our inspectors (early in 1939). No mosquito larvae could be found in cisterns in which *Gambusia* were seen. As a Works Progress Administration project, the Monroe County sanitary officer had been using a small crew of men to place *Gambusia holbrooki* minnows in Key West cisterns.

On the strength of this information it was decided to stock every cistern in the city with minnows unless it was mosquito-tight or unless the householder absolutely refused and would agree only to having his cistern oiled regularly by one of our inspectors. It was decided to introduce one fish per square foot of water surface, or to place 50 fish in an average cistern. Later this figure was reduced to 40 fish in order to speed up the work to completion. A total of 95,041 *Gambusia* minnows was placed in 2,754 containers.

TABLE 1.—*Number of containers stocked with Gambusia holbrooki minnows, January to April 1939*

Type of container	Number
Cisterns	1,887
Wells	717
Miscellaneous, including rain barrels	150
Total	2,754

It was found that the easiest way to catch minnows in the ponds was to lower a fine mesh dip net into the water, to sprinkle bread, meat, or crawfish particles on the water, and then to raise the net after the fish in the vicinity had been attracted by the food and had begun to feed.

After the fish were caught they were acclimated for cistern stocking by being placed successively in containers of pond water, a mixture of pond and cistern water, and cistern water.

Care was necessary in handling them to minimize loss. The pregnant females were more susceptible to handling and chlorination injuries than the males. Claims have been made that females could be handled without injury when being transferred but that males required exceptionally careful treatment (*5*). The inspectors engaged in cistern stocking found that with reasonable care neither males nor females appeared to be harmed and they could be poured into cisterns or introduced with soup ladles through small openings when necessary. Even with careful handling there was some loss of fish daily.

To protect against possible introduction of contamination into cisterns which were being stocked with *Gambusia holbrooki*, the Monroe County sanitary officer had placed the minnows overnight in a bath of chlorinated water before transferring them to cisterns. This practice was continued by us. Experiments were made to find the tolerance of these minnows to chlorinated water, and a chlorine dosage that would give a residual of 0.1 to 0.15 part per million was found most satisfactory. The fish are as susceptible to overchlorination as they are to overcrowding.

While cistern stocking was in progress it was discovered that *Gambusia* could not clean up a cistern that was heavily infested with

mosquito larvae. When such an infested cistern was found, the surface of the water was sprayed with kerosene, and *Gambusia* were introduced after the kerosene had killed the larvae. A film of kerosene on the water surface did not seem to harm the *Gambusia*.

PERSISTENCE OF *GAMBUSIA HOLBROOKI* MINNOWS

Eight months after the cisterns had been stocked, the Monroe County sanitary officer reported "the fish are doing remarkably well in the cisterns and wells. A very low percentage of cisterns have to be restocked after each round" of house-to-house inspections (*6*).

A careful inspection was made of the Key West cisterns in May and June 1940 in order to observe as accurately as possible the persistence of the *Gambusia* minnows.

Of 2,376 containers that were reinspected, 1,105 contained fish, and mosquito larvae were seen in only 8 of these containers. Fish were found in roughly half of the cisterns inspected. Many of the cisterns had been pumped dry or had been pumped out for cleaning and had not been restocked with fish when refilled. Our educational efforts when the cisterns were stocked with fish in 1939 have done some good since it is not infrequent for the Monroe County sanitary officer to receive a request from a householder for *Gambusia* minnows to restock his cistern after it has been cleaned.

Fish have disappeared from many wells because it is easy for children and others to remove them. It is not surprising that fish were seen in only two of the rain barrels that were inspected because owners usually were not interested when the barrels were stocked with fish in 1939.

TABLE 2.—*Number of containers with and without minnows when reinspected in May and June 1940*

Type	Number	Minnows present	Minnows present		Minnows absent		Estimated number of minnows observed
			Larvae absent	Larvae present	Larvae absent	Larvae present	
Cisterns	1,708	839	833	6	477	392	9,450
Wells	596	264	263	1	116	216	756
Rain barrels	72	2	1	1	46	24	4
Total	2,376	1,105	1,097	8	639	632	10,210

The effectiveness of the *Gambusia* minnows in controlling mosquito larvae in cisterns was demonstrated very clearly. Mosquito larvae were seen in only 6 cisterns out of 839 in which fish were observed.

FIGURE 1 (above) and FIGURE 2 (below).—Cisterns unprotected against *Aëdes aegypti* production. These are typical of many cisterns that were stocked with *Gambusia holbrooki* minnows. Note the condition of the yards. Inspectors instructed householders to turn upside down all dishpans, washtubs, etc., when they were not in use.

FIGURE 3.—Unused cistern that is not mosquito-tight. Kerosene spray is being applied to the water surface through a small opening in the wall. *Gambusia* minnows will be introduced later

FIGURE 4.—Inspector using a hand mirror to reflect sunlight into water to aid in looking for mosquito larvae and for minnows. This is far superior to using a flashlight.

Likewise, only 1 well out of 264 containing fish was found to have mosquito larvae in it.

It is worth noting that, where no fish could be found, mosquito larvae were present in 392 of 869 cisterns, 216 of 332 wells, and 24 of 70 rain barrels.

SUMMARY

The top-feeding minnow, *Gambusia holbrooki*, obtained locally, was used successfully to control *Aëdes aegypti* mosquitoes in their larval stage in drinking water cisterns and in wells. These cisterns are the principal source of this species of mosquitoes in Key West.

Where cisterns contained a heavy infestation of mosquito larvae they were sprayed with kerosene first and the *Gambusia* were introduced later.

Before the fish were introduced into a cistern they were placed overnight in chlorinated water to cleanse them.

CONCLUSION

Using *Gambusia holbrooki* minnows is a more enduring method of mosquito control for cisterns than oiling the water surface at intervals. Benefits from oiling cease if it is not continued at regular intervals, while fish will reproduce and will operate indefinitely unless disease, natural enemies, carelessness in emptying cisterns, or other unforeseen causes lead to their extermination.

ACKNOWLEDGEMENTS

The careful work of those members of the Aëdes Aegypti Control Unit who inspected, stocked, and restocked the many water containers in Key West is acknowledged. The cooperation of Mr. Z. D. Harrison, Monroe County sanitary officer, in furnishing advice and assistance whenever needed cannot be acknowledged too gratefully.

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(*2*) Connor, M. E.: Fish as mosquito destroyers. Natural History, **21:** 279–281 (1921).
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(*4*) Jackson, C. E.: Communication from U. S. Bureau of Fisheries, Washington, D. C., February 16, 1939.
(*5*) Williams, L. L., Jr.: Communication from National Institute of Health, Malaria Investigations, Washington, D. C., November 12, 1938.
(*6*) Harrison, Z. D.: Private communication, December 11, 1939.

COURT DECISION ON PUBLIC HEALTH

City ordinance prescribing hours for sale of uncured or uncooked meats upheld.—(California District Court of Appeal, Fourth District; *Justesen's Food Stores, Inc.*, v. *City of Tulare et al.*, 111 P.2d 424; decided March 22, 1941.) An ordinance of the city of Tulare made it unlawful to sell or offer for sale any uncured or uncooked meats except between the hours of 7:30 a. m. and 6 p. m. on days other than Saturday, Sunday, and certain specified holidays and except between the hours of 7:30 a. m. and 9 p. m. on Saturday. It was also made unlawful to keep, or permit to be kept, open for business any establishment selling uncured or uncooked meats or to receive at such establishment any such meats or to remove therefrom any such meats for sale or delivery, except between the hours above stated. If any other business was carried on in the same room and it was desired to operate such business on the days or during the hours prohibited to the meat business, it was required that a permanent partition not less than 7 feet in height should enclose and separate the place where such other business was carried on from the remaining part of the room where the meat business was conducted.

The plaintiff, which was engaged in the ordinary general grocery store business, brought an action to obtain an injunction against the enforcement of the above-mentioned provisions of the city ordinance. From a judgment of the lower court dismissing the action the plaintiff appealed to the district court of appeal, contending that the ordinance contravened the Federal and State constitutions in that it deprived the plaintiff of its liberty and property without due process of law. The appellate court was of the view that the challenged ordinance was valid. Relative to the provisions concerning hours, it was said that, in order to make inspections efficacious in the protection of the public health, it was necessary and reasonable to make regulations to insure that meat markets and butcher shops should not be open except at specified reasonable hours. With respect to the section relating to the separation by a partition of different businesses, the court said that it was a legitimate exercise of the police power and not unreasonable. In closing its opinion the court stated the rule regarding the due process of law clause, enunciated in a prior State case, to the effect that, when the necessity or propriety of an enactment is a question upon which reasonable minds might differ, the propriety and necessity of such an enactment was a matter of legislative determination.

DEATHS DURING WEEK ENDED MAY 24, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 24, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	8, 295	8, 251
Average for 3 prior years	8, 124	
Total deaths, first 21 weeks of year	190, 304	191, 373
Deaths per 1,000 population, first 21 weeks of year, annual rate	12.7	12 8
Deaths under 1 year of age	523	493
Average for 3 prior years	493	
Deaths under 1 year of age, first 21 weeks of year	11, 107	10, 683
Data from industrial insurance companies:		
Policies in force	64, 482, 605	65, 481, 168
Number of death claims	11, 779	12, 309
Death claims per 1,000 polices in force, annual rate	9. 5	9 8
Death claims per 1,000 policies, first 21 weeks of year, annual rate	10. 4	10 5

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PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 31, 1941

Summary

As compared with the preceding week, increased incidence was reported for the current week for only 3 of the 9 communicable diseases included in the following weekly table, namely, influenza, smallpox, and typhoid fever. The number of reported cases of measles dropped from 35,044 to 26,221, decreases being recorded in all geographic areas.

The total number of cases of poliomyelitis dropped from 27 to 20; and of these, 5 cases were reported in Florida and 7 in California. To date (first 22 weeks) 511 cases have been reported for the United States as a whole, of which Florida has reported 68, California 42, Texas 23, and New York 22. The number of cases reported so far this year exceeds the 5-year (1936–40) cumulative median expectancy (468) and the number of cases reported for the corresponding period of each of the 5 preceding years except 1940 (546 cases).

Three cases of Rocky Mountain spotted fever were reported in the Atlantic States and 20 cases in the Mountain States. Of 22 cases of endemic typhus fever, 8 cases were reported in Texas, 6 in Georgia, and 4 in Florida.

Information received during the current week states that several cases of encephalitis, with at least 2 deaths, were reported in Cameron County, Tex., where an epidemic of equine encephalomyelitis had caused the death of 70 horses.

The death rate for the week ended May 31, 1941, for 87 major cities in the United States, as reported by the Bureau of the Census, dropped from 11.6 per 1,000 population for the preceding week to 10.9, the same as the 3-year (1938–40) average for the corresponding week. The cumulative rate for the first 22 weeks of the current year is 12.6, as compared with 12.7 for the corresponding period of 1940 (all rates are on an annual basis).

Telegraphic morbidity reports from State health officers for the week ended May 31, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	May 31, 1941	June 1, 1940		May 31, 1941	June 1, 1940		May 31, 1941	June 1, 1940		May 31, 1941	June 1, 1940	
NEW ENG.												
Maine	1	0	0	------	------	------	76	344	105	0	0	0
New Hampshire	0	0	0	------	------	------	23	11	11	0	0	0
Vermont	0	0	0	------	------	------	23	2	79	0	0	0
Massachusetts	4	3	3	------	------	------	790	1,185	976	1	1	2
Rhode Island	0	0	0	------	------	------	0	193	81	1	0	0
Connecticut	0	0	0	1	1	1	397	26	149	0	0	0
MID. ATL.												
New York	9	15	20	[2] 1	[2] 6	[2] 6	2,731	919	2,150	7	1	5
New Jersey [1]	9	4	7	1	4	4	1,223	990	724	0	0	1
Pennsylvania [3]	16	14	24	------	------	------	4,664	454	1,560	2	2	8
E. NO. CEN.												
Ohio	4	8	15	6	38	22	1,716	43	608	0	1	5
Indiana	10	5	7	11	4	6	727	22	22	0	0	0
Illinois	16	13	31	9	18	15	1,248	163	163	1	1	3
Michigan [1]	2	1	6	1	11	2	1,639	610	403	1	2	2
Wisconsin	0	2	2	9	19	23	1,634	1,005	743	0	0	0
W. NO. CEN.												
Minnesota	0	1	4	3	1	1	22	46	216	0	0	0
Iowa	4	1	2	1	------	2	135	145	145	0	0	0
Missouri	1	2	5	------	1	6	472	53	53	1	0	1
North Dakota	1	1	0	------	------	6	22	5	5	0	1	1
South Dakota	0	0	0	------	------	------	4	0	0	1	0	0
Nebraska	4	6	2	------	------	------	33	17	64	0	1	0
Kansas	10	1	3	2	1	1	358	407	58	0	0	0
SO. ATL.												
Delaware	0	0	0	------	------	------	80	1	17	0	0	0
Maryland [1] [3]	0	1	2	4	1	2	411	4	129	1	0	1
Dist. of Columbia	1	3	4	------	------	------	204	2	110	1	0	0
Virginia [3]	8	3	8	71	48	48	919	227	379	2	1	1
West Virginia [1]	3	3	5	------	5	11	502	15	48	0	1	3
North Carolina [4]	10	8	8	------	6	1	1,294	157	309	0	0	1
South Carolina	7	9	2	192	128	77	670	20	64	1	1	1
Georgia [4]	1	3	3	12	14	------	272	73	73	0	1	0
Florida [4]	4	6	6	14	------	3	315	116	44	0	0	1
E. SO. CEN.												
Kentucky	2	2	4	------	49	3	610	79	79	1	0	3
Tennessee	4	3	3	10	19	20	365	153	104	0	0	3
Alabama [4]	6	4	6	31	14	27	276	89	89	4	3	3
Mississippi [1]	2	3	3	------	------	------	------	------	------	1	0	0
W. SO. CEN.			6									
Arkansas	2	3	3	7	6	12	215	108	28	0	0	0
Louisiana	0	5	5	1	19	6	17	3	27	1	1	0
Oklahoma	5	3	6	17	10	22	127	15	48	0	1	0
Texas [4]	17	15	30	389	121	121	900	1,058	389	8	0	1
MOUNTAIN												
Montana [3]	0	0	0	------	6	------	24	31	31	0	0	1
Idaho	0	0	0	------	------	------	37	37	25	0	0	0
Wyoming [3]	1	0	0	------	------	------	13	24	16	0	1	0
Colorado	6	9	6	17	8	------	379	43	44	0	0	0
New Mexico	0	1	1	------	------	1	81	56	52	0	0	0
Arizona	0	2	1	50	40	27	59	35	33	1	0	0
Utah [1] [3]	0	0	0	1	------	------	28	479	86	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	1	1	------	------	------	21	320	320	1	0	0
Oregon	1	4	1	7	5	11	79	345	74	0	0	0
California [4]	5	15	21	[5] 1,203	19	34	386	354	624	1	0	2
Total	176	183	332	2,071	622	622	26,221	10,484	12,783	38	20	51
22 weeks	5,836	7,032	10,330	590,928	164,674	147,113	722,223	172,434	218,257	1,059	878	1,690

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 31, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	May 31, 1941	June 1, 1940		May 31, 1941	June 1, 1940		May 31, 1941	June 1, 1940		May 31, 1941	June 1, 1940	
NEW ENG.												
Maine	0	0	0	3	10	10	0	0	0	0	0	1
New Hampshire	0	0	0	3	1	5	0	0	0	0	0	0
Vermont	0	0	0	10	2	6	0	0	0	0	0	0
Massachusetts	0	0	0	134	101	179	0	0	0	13	4	1
Rhode Island	0	0	0	1	4	23	0	0	0	0	0	0
Connecticut	0	0	0	39	52	52	0	0	0	0	4	2
MID. ATL.												
New York	1	0	1	389	661	566	0	0	0	7	4	4
New Jersey [1]	0	0	0	144	284	131	0	0	0	1	2	2
Pennsylvania [3]	0	1	0	339	271	292	0	0	0	6	9	7
E. NO. CEN.												
Ohio	0	2	0	232	369	267	0	0	2	2	9	8
Indiana	0	0	0	81	87	87	0	1	22	0	5	1
Illinois	0	0	0	179	650	401	4	9	15	2	2	5
Michigan [1]	0	0	0	182	238	271	7	0	1	1	0	2
Wisconsin	0	0	0	89	109	144	2	3	2	1	1	1
W. NO. CEN.												
Minnesota	0	0	0	48	55	78	0	7	16	0	0	0
Iowa	1	1	0	16	22	64	8	3	22	3	0	0
Missouri	0	0	0	81	38	91	2	0	28	4	10	8
North Dakota	0	0	0	0	2	16	0	0	11	0	4	2
South Dakota	1	0	0	9	2	15	3	1	14	0	2	0
Nebraska	0	0	0	15	6	14	0	1	4	0	0	0
Kansas	0	0	0	24	42	57	0	1	9	2	2	1
SO. ATL.												
Delaware	0	0	0	16	2	2	0	0	0	0	0	0
Maryland [1] [3]	0	0	0	46	43	33	0	0	0	3	1	2
Dist. of Col.	0	0	0	11	20	11	0	0	0	0	1	1
Virginia [3]	0	0	0	17	36	23	0	0	0	7	0	6
West Virginia [1]	0	0	0	50	20	26	0	0	0	5	8	5
North Carolina [4]	0	0	1	9	20	18	0	0	1	1	4	7
South Carolina	0	1	1	4	1	5	0	0	0	2	3	8
Georgia [4]	0	0	0	9	10	6	0	0	0	4	11	11
Florida [4]	5	0	0	1	5	4	0	1	0	2	3	2
E. SO. CEN.												
Kentucky	0	0	0	59	37	19	3	1	1	5	5	5
Tennessee	1	0	0	44	44	31	3	8	3	2	20	9
Alabama [4]	0	0	0	20	7	6	0	4	0	3	2	4
Mississippi [1]	1	1	0	1	5	2	1	0	0	1	1	2
W. SO. CEN.												
Arkansas	1	0	0	4	11	4	5	4	4	2	4	10
Louisiana	0	1	1	2	7	6	0	1	0	13	7	10
Oklahoma	1	0	0	9	10	19	2	1	8	1	5	7
Texas [4]	1	2	2	21	19	50	0	3	7	13	8	12
MOUNTAIN												
Montana [3]	0	0	0	7	5	12	0	0	5	0	1	1
Idaho	0	3	0	7	4	6	0	0	1	0	1	1
Wyoming [3]	0	0	0	2	3	7	0	1	1	0	0	0
Colorado	0	0	0	13	22	33	0	1	3	1	2	1
New Mexico	0	0	0	1	2	9	0	0	0	1	0	0
Arizona	0	0	0	6	0	5	0	0	0	1	0	1
Utah [1] [3]	0	0	0	5	9	14	0	0	0	0	0	0
Nevada	0	-----	-----	0	-----	-----	0	-----	-----	0	-----	-----
PACIFIC												
Washington	0	25	0	14	40	29	0	0	8	6	2	1
Oregon	0	1	1	4	6	19	1	0	7	1	0	2
California [4]	7	9	6	60	92	155	1	1	2	6	5	7
Total	20	47	36	2,460	2,476	3,476	42	47	242	122	147	192
22 weeks	511	546	468	79,226	104,165	120,897	998	1,548	6,780	1,812	1,858	2,606

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 31, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended— May 31, 1941	Whooping cough, Week ended— June 1, 1940
NEW ENG.		
Maine	25	12
New Hampshire	5	16
Vermont	11	7
Massachusetts	203	130
Rhode Island	24	0
Connecticut	47	33
MID. ATL.		
New York	215	343
New Jersey [1]	73	58
Pennsylvania [2]	316	238
E. NO. CEN.		
Ohio	235	289
Indiana	47	16
Illinois	101	50
Michigan [1]	290	217
Wisconsin	113	60
W. NO. CEN.		
Minnesota	68	41
Iowa	29	26
Missouri	64	28
North Dakota	10	5
South Dakota	7	3
Nebraska	17	12
Kansas	146	30
SO. ATL.		
Delaware	0	6
Maryland [1 3]	95	81
Dist. of Col.	10	8
Virginia [3]	53	68
West Virginia [1]	29	83
North Carolina [4]	222	107
SO. ATL.—continued		
South Carolina	234	24
Georgia [4]	24	17
Florida [4]	33	2
E. SO. CEN.		
Kentucky	65	72
Tennessee	100	33
Alabama [4]	123	11
Mississippi [1]	----------	----------
W. SO. CEN.		
Arkansas	43	15
Louisiana	2	48
Oklahoma	15	10
Texas [4]	374	391
MOUNTAIN		
Montana [3]	12	4
Idaho	11	12
Wyoming [3]	7	1
Colorado	187	20
New Mexico	13	14
Arizona	18	42
Utah [1 3]	51	147
Nevada	0	----------
PACIFIC		
Washington	126	41
Oregon	17	36
California [4]	568	385
Total	4,478	3,292
22 weeks	101,101	69,784

[1] Period ended earlier than Saturday.
[2] New York City only.
[3] Rocky Mountain spotted fever, week ended May 31, 1941, 23 cases as follows: Pennsylvania, 1; Maryland, 1; Virginia, 1; Montana, 13; Wyoming, 6; Utah, 1.
[4] Typhus fever, week ended May 31, 1941, 22 cases as follows: North Carolina, 1; Georgia, 6; Florida, 4; Alabama, 2; Texas, 8; California, 1.
[5] Mostly delayed reports.

PLAGUE INFECTION IN CALIFORNIA

IN FLEAS IN KERN COUNTY

Under date of May 24, 1941, N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved by animal inoculation and cultures, in 298 fleas from 20 *beecheyi* squirrels, submitted to the laboratory April 29, 1941; in 64 fleas from 11 *beecheyi* squirrels submitted to the laboratory April 29; and in 46 fleas from 3 *beecheyi* squirrels submitted to the laboratory May 14, 1941, all from the J. McKenzie Ranch, 7 miles south and 5 miles west of Tehachapi, Kern County, Calif.

PLAGUE INFECTION IN IDAHO

IN FLEAS IN CANYON COUNTY AND PAYETTE COUNTY

Under date of May 23, 1941, N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved positive upon laboratory examination in fleas from 22 ground squirrels shot May 14, 1941, 7 miles north of Parma, on U. S. Highway 95, Canyon County, and in another lot of fleas from 13 ground squirrels shot May 14, 1941, 5 to 6 miles north of the junction of U. S. Highway 95 and State Highway No. 49, on U. S. Highway No. 95, Payette County, Idaho.

CASE OF PSITTACOSIS IN OAK PARK, ILLINOIS

According to a report received from Dr. Roland R. Cross, director of the Illinois State Department of Health, a case of psittacosis occurred in Oak Park, Ill., on March 28, 1941. The infection was apparently contracted from love birds. Three birds, purchased by the patient in Chicago, died within a period of 2 or 3 months, the last one dying on April 5. The patient recovered.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 17, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	114	76	32	4,754	492	1,819	17	374	24	1,200	-------
Current week [1]	43	44	15	10,261	307	1,381	2	389	21	1,543	-------
Maine:											
Portland	0	------	0	2	3	1	0	0	0	17	22
New Hampshire:											
Concord	0	------	0	1	0	0	0	1	0	0	12
Manchester	0	------	0	0	1	0	0	1	0	0	10
Nashua	0	------	0	0	0	0	0	0	0	12	10
Vermont:											
Barre	------		------	------	------	------	------	------	------	------	------
Burlington	0	------	0	1	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	0	273	5	91	0	8	2	39	175
Fall River	0	------	0	1	2	5	0	0	0	3	29
Springfield	0	------	0	35	0	14	0	1	0	12	24
Worcester	0	------	0	25	5	12	0	0	1	6	56
Rhode Island:											
Pawtucket	0	------	0	0	0	6	0	0	0	2	18
Providence	0	------	0	4	1	3	0	0	0	23	54
Connecticut:											
Bridgeport	0	------	0	29	1	4	0	2	0	0	32
Hartford	0	------	0	4	1	6	0	2	0	7	46
New Haven	0	------	0	4	1	11	0	0	0	7	31
New York:											
Buffalo	0	------	0	83	8	46	0	4	0	25	114
New York	16	4	1	2,216	47	276	0	86	4	84	1,408
Rochester	0	------	0	276	1	2	0	2	0	12	67
Syracuse	0	------	0	3	0	4	0	0	0	7	46
New Jersey:											
Camden	2		0	14	1	14	0	0	1	3	23
Newark	0	3	1	110	8	45	0	6	0	13	95
Trenton	0	2	0	40	0	17	0	2	0	0	31
Pennsylvania:											
Philadelphia	1	1	1	772	15	151	0	24	2	88	445
Pittsburgh	0	------	0	1,245	10	17	0	6	0	46	143
Reading	0	------	0	99	1	13	0	2	1	6	27
Scranton	0	------	------	40	------	0	0	------	0	2	------
Ohio:											
Cincinnati	0	------	0	75	1	8	0	6	0	2	109
Cleveland	2	4	1	73	8	71	0	12	0	75	187
Columbus	0	1	1	50	3	13	0	2	0	15	88
Toledo	0	------	0	468	2	5	0	6	0	36	54
Indiana:											
Anderson	0	------	0	13	0	0	0	0	0	0	12
Fort Wayne	0	------	0	35	3	0	0	0	0	5	28
Indianapolis	0	------	1	682	8	13	0	3	0	11	103
Muncie	0	------	0	36	2	7	0	0	0	0	11
South Bend	0	------	0	33	4	1	0	0	0	0	18
Terre Haute	0	------	0	4	0	0	0	0	0	0	20
Illinois:											
Alton	0	------	0	2	2	3	0	0	0	0	8
Chicago	2	------	1	307	14	149	0	44	0	40	673
Elgin	0	------	0	12	1	2	0	0	0	0	5
Moline	0	------	0	19	0	0	0	0	0	0	6
Springfield	0	------	0	30	3	7	0	0	0	1	28
Michigan:											
Detroit	1	------	0	498	12	134	0	22	0	137	258
Flint	0	------	0	62	2	3	0	0	0	10	25
Grand Rapids	1	------	0	229	1	7	0	0	0	9	26
Wisconsin:											
Kenosha	0	------	0	88	0	2	0	0	0	0	9
Madison	0	------	0	34	0	4	0	0	0	3	20
Milwaukee	1	------	0	637	2	25	0	2	0	37	95
Racine	2	------	0	20	1	5	0	0	0	2	13
Superior	0	------	0	1	0	0	0	0	0	12	7
Minnesota:											
Duluth	0	------	0	1	1	0	0	0	0	29	20
Minneapolis	1	------	0	10	5	21	0	0	0	27	101
St. Paul	0	------	0	0	4	11	0	1	0	20	63

[1] Figures for Barre, Shreveport, and San Antonio estimated; reports not received.

City reports for week ended May 17, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0			5		0	0		0	0	
Davenport	0			5		1	0		0	0	
Des Moines	0			11		1	0		0	5	38
Sioux City	0			1		0	0		0	6	
Waterloo	0			18		1	0		0	1	
Missouri:											
Kansas City	0		0	146	7	9	2	4	0	16	103
St. Joseph	0		0	10	2	0	0	1	0	0	17
St. Louis	0	1	1	312	10	60	0	6	0	35	185
North Dakota:											
Fargo	0		0	0	0	0	0	1	0	16	8
Grand Forks	0			0		0	0		0	0	
Minot	1			10		0	0		0	3	12
South Dakota:											
Aberdeen	0			0		0	0		0	1	
Sioux Falls	0			0		5	0		0	0	8
Nebraska:											
Omaha	0		0	8	3	3	0	2	0	2	43
Kansas:											
Lawrence	0		0	2	1	0	0	1	0	1	3
Topeka	0		0	94	2	1	0	0	0	20	13
Wichita	0	1	0	3	3	2	0	1	0	14	28
Delaware:											
Wilmington	0		0	9	1	4	0	1	0	2	33
Maryland:											
Baltimore	1	1	0	225	13	16	0	18	3	54	207
Cumberland	0		0	7	0	1	0	0	0	2	16
Frederick	0		0	0	1	0	0	0	0	0	2
Dist. of Col.:											
Washington	0		0	251	9	11	0	9	1	23	203
Virginia:											
Lynchburg	1		0	5	0	0	0	0	0	0	10
Norfolk	0		0	25	0	2	0	1	0	1	21
Richmond	1		2	84	2	1	0	1	0	0	59
Roanoke	0		0	12	0	0	0	2	0	0	20
West Virginia:											
Charleston	0		0	0	2	0	0	2	1	0	13
Huntington	0			28		1	0		0	3	
Wheeling	0		0	90	1	2	0	0	0	3	20
North Carolina:											
Gastonia	0			20		0	0		0	3	
Raleigh	0		0	42	2	0	0	4	0	42	17
Wilmington	0		0	17	0	0	0	0	0	11	5
Winston-Salem	0		0	6	2	0	0	1	0	3	27
South Carolina:											
Charleston	0	4	0	4	1	0	0	0	0	0	26
Florence	0		0	1	2	0	0	0	0	1	5
Greenville	0		0	3	2	0	0	0	0	6	10
Georgia:											
Atlanta	1		0	12	0	3	0	5	0	0	69
Brunswick	0		0	4	0	0	0	0	1	0	3
Savannah	0	1	0	1	3	6	0	1	1	0	31
Florida:											
Miami	0		0	8	2	0	0	0	2	7	31
St. Petersburg	0		0	24	0	0	0	0	0	5	16
Tampa	0		1	0	1	1	0	1	1	0	25
Kentucky:											
Ashland	1		0	5	1	0	0	0	0	0	6
Covington	0		0	2	1	1	0	0	0	0	15
Lexington	0		0	2	0	0	0	1	0	2	12
Louisville	0		0	710	1	49	0	2	0	11	62
Tennessee:											
Knoxville	0		0	22	1	2	0	2	0	6	25
Memphis	0		0	84	0	2	0	9	0	23	88
Nashville	0		1	51	1	2	0	5	0	12	72
Alabama:											
Birmingham	0	2	0	44	3	2	0	2	0	3	62
Mobile	0	1	0	1	4	0	0	0	1	0	26
Montgomery	0	1		27		3	0		0	1	
Arkansas:											
Fort Smith	0			6		0	0		1	0	
Little Rock	0		0	27	1	0	0	3	0	3	26
Louisiana:											
Lake Charles	0		0	1	0	0	0	0	0	0	1
New Orleans	0	2	1	14	6	2	0	16	1	0	117
Shreveport											

City reports for week ended May 17, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Oklahoma:											
Oklahoma City	0	------	0	17	5	1	0	1	1	2	47
Tulsa	0	------	0	66	3	3	0	1	0	8	16
Texas:											
Dallas	1	------	0	38	1	3	0	3	0	4	61
Fort Worth	0	------	1	16	1	0	0	0	0	5	53
Galveston	0	------	0	0	0	2	0	1	0	0	14
Houston	0	------	0	1	6	1	0	11	0	21	101
San Antonio	------	------	------	------	------	------	------	------	------	------	------
Montana:											
Billings	0	------	0	0	1	2	0	1	0	1	7
Great Falls	0	------	0	1	1	1	0	1	0	0	8
Helena	0	------	0	3	0	0	0	0	0	0	4
Missoula	0	------	0	0	1	0	0	0	0	0	8
Idaho:											
Boise	0	------	0	7	0	1	0	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	2	0	4	0	0	0	5	14
Denver	3	5	0	443	5	2	0	2	0	154	78
Pueblo	0	------	0	0	1	0	0	1	0	0	8
New Mexico:											
Albuquerque	0	------	0	36	1	0	0	2	0	2	13
Arizona:											
Phoenix	0	32	0	3	0	0	0	0	0	10	------
Utah:											
Salt Lake City	1	------	0	8	3	3	0	0	0	23	40
Washington:											
Seattle	1	------	0	0	2	2	0	0	0	47	91
Spokane	0	------	0	11	1	3	0	0	0	4	34
Tacoma	0	------	0	0	0	2	0	2	0	7	36
Oregon:											
Portland	1	1	1	5	2	3	0	0	0	1	76
Salem	0	------	------	2	------	0	0	------	0	0	------
California:											
Los Angeles	0	9	1	87	7	18	0	19	0	70	344
Sacramento	3	1	0	4	2	1	0	0	0	32	37
San Francisco	1	3	0	20	6	8	0	4	0	66	149

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases	State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:				**Missouri:**			
Worcester	0	1	0	Kansas City	1	0	0
New York:				**Maryland:**			
Buffalo	1	0	0	Baltimore	2	0	0
New York	4	3	0	**Florida:**			
Pennsylvania:				Miami	0	0	1
Philadelphia	0	0	1	**Tennessee:**			
Pittsburgh	1	0	0	Knoxville	0	1	0
Indiana:				**Alabama:**			
Indianapolis	1	2	0	Birmingham	1	0	0
Illinois:				**Arizona:**			
Chicago	1	0	0	Phoenix	0	0	3
Michigan:							
Detroit	0	1	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 1; San Francisco, 1. Deaths: Cleveland, 1.
Pellagra.—Cases: Birmingham, 1.
Rabies in man.—Deaths: Pittsburgh, 1; Cincinnati, 1.
Typhus fever.—Cases: New York, 1; Savannah, 1; Miami, 1; Tampa, 1; Mobile, 1; Los Angeles, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—**A rat found on May 1, 1941, and another rat found on May 2, at Kalopa Camp, Hamakua District, Island of Hawaii, T. H., have been proved positive for plague.**

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 3, 1941.—During the week ended May 3, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		9	1	7	8	1		1	2	29
Chickenpox		34	1	209	164	20	15	24	51	518
Diphtheria		15	1	13	16	1	2	1	3	52
Dysentery				3					1	4
Influenza		18			31	1			6	56
Measles	3	99	11	542	1,431	74	44	130	478	2,812
Mumps				330	346	33	24	19	34	786
Pneumonia		20			8	1			7	36
Scarlet fever		28	11	120	170	4	6	11	16	366
Tuberculosis	2	8	12	139	48	2				211
Typhoid and paratyphoid fever				12	3				1	16
Whooping cough		2		75	167	1	2	4	38	289

JAMAICA

Notifiable diseases—4 weeks ended May 10, 1941.—During the 4 weeks ended May 10, 1941, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

	Kingston	Other localities		Kingston	Other localities
Cerebrospinal meningitis		1	Poliomyelitis	1	
Chickenpox	7	24	Puerperal fever		1
Diphtheria	1	5	Scarlet fever	1	1
Dysentery	5	2	Tuberculosis	20	63
Erysipelas		2	Typhoid fever	2	34
Leprosy		4			

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of May 30, 1941, pages 1187-1189. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China—Canton.—A report dated May 21, 1941, stated that up to May 19, 1941, 52 cases of cholera with 27 deaths had been reported in Canton, China.

Smallpox

Ceylon—Colombo.—A report dated May 16, 1941, from the American Consul at Colombo, Ceylon, stated that within the last few weeks 20 cases of smallpox had occurred in the city of Colombo and 12 cases outside the city.

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Public Health Reports

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IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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THE NATIONAL NUTRITION CONFERENCE [1]

The National Nutrition Conference for Defense, summoned by the President, convened in Washington, D. C., on May 26, 27, and 28, 1941. Nine hundred delegates from all parts of the country assembled to participate in this Conference. The fields of medicine and of nutrition were well represented by physicians, public health professionals, chemists, research workers in nutrition, and leaders in home economics and the work of home demonstration. Other delegates represented the social-service professions, agriculture, labor, industry, consumer groups, and governmental agencies.

It is altogether likely that a program of nutrition would in the natural course of events have been undertaken as essential to the national welfare. Scientists investigating the secrets of nutrition have been adding amazing facts in recent years to our knowledge of food. Data from a number of surveys have been steadily indicating that undernourishment is widespread among the people of this country and is serious enough to be an affliction among that one-third of the population living along or below the subsistence level. Many people with the means to eat well live on diets lacking in essential elements.

Events in 1940 served as a warning to those who are nutrition-minded that eating to live and to be able to work and otherwise carry on life's activities is not enough, that America must eat to be adequate to hold her own in a warring world. As 1940 wore on, the idea gained ground that serious preparations for national defense must entail plans for a program of national nutrition. A planning and policy committee on nutrition, representing the different agencies of the United States Government, with M. L. Wilson, of the Extension Service, Department of Agriculture, as chairman, was organized. This was done at the request of the Division of Consumer Protection of the National Defense Advisory Commission. Late in November 1940 Mr. Paul V. McNutt was made Coordinator of Health, Welfare,

[1] Complete proceedings of the National Nutrition Conference will be available later upon request through the Office of the Administrator, Federal Security Agency, Washington, D. C.

and Related Defense Activities, and under his direction the program began to take shape.

The President set forth his expectations from the National Nutrition Conference to Mr. McNutt in the following letter:

MY DEAR GOVERNOR: I am highly gratified to learn that invitations to the National Nutrition Conference for Defense have met with such generous response. It demonstrates the eager interest of the public, of educational and research centers, of medical and social sciences alike. I only regret that because of the pressure of these critical days I shall be unable to meet with you.

The Conference has significant responsibilities to explore and define our nutrition problems, and to map out recommendations for an immediate program of action. This is vital. During these days of stress the health problems of the military and civilian population are inseparable. Total defense demands manpower. The full energy of every American is necessary. Medical authorities recognize completely that efficiency and stamina depend on proper food. Fighting men of our armed forces, workers in industry, the families of these workers, every man and woman in America, must have nourishing food. If people are undernourished, they cannot be efficient in producing what we need in our unified drive for dynamic strength.

In recent years scientists have made outstanding discoveries as to the amounts and kinds of foods needed for maximum health and vigor. Yet every survey of nutrition, by whatever methods conducted, showed that here in the United States undernourishment is widespread and serious. The Department of Agriculture has estimated that many millions of men, women, and children do not get the foods which science considers essential. We do not lack and we will not lack the means of producing food in abundance and variety. Our task is to translate this abundance into reality for every American family.

I shall follow the work of the Conference with deep interest and expectantly await its recommendations.

Very sincerely yours,

(Signed) FRANKLIN D. ROOSEVELT.

In this abstract of the proceedings it is possible to give only in a summary way the substance of these 3 days of discussion. Paul V. McNutt, Coordinator of Health, Welfare, and Related Defense Activities, opened the first general session with "The Challenge of Nutrition." "Nutrition in the First World War and Now" was the subject of John R. Murlin, professor of physiology, University of Rochester. Henry C. Sherman, professor of nutrition, Columbia University, discussed "Adequate Nutrition and Human Welfare." "Nutrition and National Defense" was presented by Henry A. Wallace, Vice President of the United States; "Agricultural Policies and National Nutrition," by Claude R. Wickard, Secretary of Agriculture; "Food and Foreign Policy," by Adolf A. Berle, Jr., Assistant Secretary of State; "Labor's Stake in a National Nutrition Program," by Frances Perkins, Secretary of Labor. Harriett Elliott, Consumer Advisor, Office for Emergency Management, discussed "Nutrition and Consumer Protection in Defense," while Lewis B. Hershey, Deputy Director, National Selective Service System, presented "National Nutrition in Relation to Selective Service." Mrs. Franklin

D. Roosevelt spoke to the closing session on "What This Conference Means to Every American."

The findings of the Committee on Foods and Nutrition of the National Research Council were discussed by Dr. Russell M. Wilder, of the Mayo Foundation, who is chairman of that committee. The following is the text of Dr. Wilder's remarks:

Mobilizing for Better Nutrition

Evidence to be presented to this conference should convince everyone that the Nation is faced with a serious problem of malnutrition, that despite a so-called surplus of foods a great many of our people are not receiving the fare they need for strength of mind and body.

The gravity of this situation, however, is not an occasion for crepe hanging and bemoaning our plight. The hopeful and challenging fact is that we now have the scientific knowledge, the means, and the national will to do something about it.

The national nutrition problem is exceedingly complex, however. Its solution depends upon the mobilization of all those sources of knowledge, activity, and good will which can be utilized for the improvement of nutrition for all the people. The various fields of national endeavor represented at this Conference give evidence of the total effort we shall have to expend in mobilizing for better nutrition.

Significant studies made by the Federal Government as long ago as 1936 bear witness that this mobilization comes none too soon. These surveys revealed that in 1936 more than one-third of all families were buying food which could not provide a diet rating better than "poor," by conservative standards. Not more than one family in four secured food which would provide a diet rated as "good."

In considering the total problem of nutrition, there has been criticism of the physician as well as by the physician. The scientists who, for 20 years or more have studied nutrition in animals, have indulged quite frequently in caustic comment on the failure of the medical profession to come to grips with malnutrition.

Practicing physicians, by and large, have been slow to act on the developments in the nutrition field. I wish to take this occasion to explain this conservatism.

The past 40 years and more have been a period of dramatic achievement in many fields of medical science and of marked success in the control of diseases caused by bacteria and related organisms. The accomplishment of the average physician, in the complexity of human pathology, is highly creditable. Few persons not trained in biology are even dimly conscious of the difficulties involved in the accurate diagnosis of disease.

Nor has the physician failed, except in nutrition, to recognize the predominant significance of preventive medicine. He has given freely of his time, usually on a purely voluntary basis, to the campaigns which have been waged with such success against tuberculosis, syphilis, and maternal ill health. Also most of the legislation to which we owe that magnificent organization, long headed by Dr. Parran, the United States Public Health Service, has come about as a result of insistence by physicians. This is equally true of the fine collateral departments of public health in our several States.

The medical profession has not been tardy either—as workers in nutrition have sometimes thought—in granting early recognition to the new in science. Salvarsan was introduced in 1910, and by 1912 was in general use for the treatment of syphilis; insulin was discovered in 1921 and by 1923 was employed the world over. The value of sulfapyridine was recognized in 1938, and patients with pneumonia received its benefit almost immediately.

Fundamental knowledge in the science of nutrition is of very recent origin. Many physicians received their academic education before scientific nutrition had accumulated the body of fact which today seems so important. Moreover, the earlier investigations were made in scientific fields whose relation with medicine was not so clearly recognized as it is today. These important contributions were published in journals other than those which the average physician reads, and became embalmed, so far as he was concerned, in scientific literature.

As in the initial years of any new science, the early findings were vague and negative. According to a popular definition, "A vitamin is something that makes you sick if you don't get it." It could scarcely be expected that men trained in a school of tangible causes and effects should be greatly concerned with infirmities for which only a negative causation could be suggested, nor could they find much substance in so vacuous a conception.

The average office practice of most physicians and even the wards of hospitals have not revealed much disability clearly related to diet. Most persons who are malnourished are scarcely sick enough to call physicians. If they do, it is for symptoms which the doctor in the past has thought were from mental or nervous disorders. Doctors long have recognized severe deficiency diseases. Pellagra, when it came full-blown with red, scaly skin on hands and neck, a red, sore tongue, and diarrhea, was diagnosed correctly. But, in most places, the number of cases of pellagra has been very small. We encountered dropsy in patients with tender nerves and other symptoms simulating the disease which, in the Orient, is known as beri-beri, but such clinical pictures were very rare. Frank scurvy, with its bleeding swollen gums, and skin spotted by blood which oozed into the tissue beneath the skin, likewise has been uncommon. Rickets in children was once terribly apparent, but of late years the general dosing of infants with cod-liver oil and more recently the irradiation of evaporated and other milk have decreased immensely the incidence of rickets.

When it came to the recognition of the more subtle forms of malnutrition and their relationship with the vitamins, physicians were wary. This is entirely understandable, for it must be remembered that diet, for centuries, has been a fertile field for quackery. Food fads have come and gone by the score. Physicians are, perhaps, more conscious of the evils of charlatanism than others without the same training.

Furthermore, the early evidence on vitamins was limited for a long time to what was learned from animal experimentation. Physicians must be careful about accepting for man conclusions based on work with lower forms of life. I beg that what I am recording will not be interpreted as lack of appreciation of work in animal nutrition. Without the basic information thus obtained, the later more convincing work could never have proceeded. My intent is, rather, to point out that the concept of vitamin activity seemed to the physician academic, rather than practical. The earlier suggestions in nutrition that this or that vegetable or fruit was an excellent, a fair, or a poor source of this or that ill-defined activity were unconvincing to a profession becoming accustomed to methods of precision both in diagnosis and treatment.

Thus, physicians demanded other evidence than the newer knowledge of vitamins applied to man. That evidence came in part from the contributions of brilliant chemists who isolated, or made available by chemical means, the vitamins in forms which could be tasted, smelled, weighed, and measured for effect.

Additional evidence came from nutritional physiologists, chemists, and clinical investigators. Methods were determined for measuring with precision the amounts of each of the several vitamins contained in foods. Methods of determining the amount of vitamins in blood and urine were likewise established so

that diagnosis of vitamin deficiency could be made in the clinical laboratory. Physicians can now think and work in terms of micrograms of vitamins with chemical names. At least this is true for several of the vitamins. The chemical designations of these substances provide a distinct advantage, for the use of alphabetical designations—A, B, C, and so on—created much confusion.

With these tools at hand, physicians have in recent years begun to display the long-awaited interest in scientific nutrition. After all, as Director Wilson has remarked, in a dynamic society we cannot demand complete scientific knowledge before acting. "Greater mistakes will be made by waiting for the golden age than by acting on knowledge at hand and changing our course as newly acquired knowledge may suggest."

Another reason for the growing acceptance of nutritional science by physicians is the increasing knowledge of the actual requirement, per person, of each of the several nutrients contained in food. We know today, beyond all doubt, that the average American diet does not provide what men and women ought to have, nor what the children of today need to become vigorous citizens of tomorrow.

In consequence, physicians now are even more concerned than are some of the scientists with the problems of health which malnutrition has created. Specialists in diseases of children were first to crystallize their interest, but of late, discussion of some aspect of human nutrition finds a place on the program of nearly every medical gathering in the Nation.

The American Medical Association organized a Committte on Foods some fifteen years ago. This earlier Committee more recently has been renamed the Council on Foods and Nutrition. As such, it is concentrating attention on the nutritive qualities of foods in general use and on the effects of various methods of processing, distribution, and preparation on those qualities.

When the President called the National Nutrition Conference for Defense, the Council on Foods and Nutrition and the Board of Trustees of the American Medical Association pledged to it their full support. They recognize the need for awakening public interest in the many problems here to be considered. They appreciate, however, that many *kinds* of experience are required to solve effectively the diverse problems facing us. Physicians in every community will cooperate in what needs doing, but with them must be ranged many other groups with other special training.

Scientific guidance is demanded from experts in nutrition. To provide this guidance, the Committee on Foods and Nutrition of the National Research Council has been organized. The broad policy of the Committee on Food and Nutrition of the National Research Council, as has been formalized by its resolutions, is to assist in securing adequate nutrition for the greatest number of people. In what it has done to date, consideration has been given and in the future such consideration will continue to be given both to the nutritional requirements and to the supply of essential nutrients in all foods. Every effort has been and will be made to supply this demand through natural foods, and the Committee is emphasizing educational and research projects and other forms of assistance designed to develop methods for the fuller and better utilization of natural foods. However, partly because of emergency conditions which now exist, specific enrichment procedures may need to be recommended. One has already been recommended, namely, enrichment of flour and bread. Others will be considered individually, each on its own merits.

Food habits offer difficulties which only experience in psychology and education will overcome. Assistance here can be looked for from the Committee on Food Habits, organized by the National Research Council.

Economics is importantly involved in any consideration for the improvement of national nutrition. Here the advice of the social economist is essential.

Very many families are unable to secure enough "protective foods." Milk, meat, eggs, fresh vegetables, and fruits are relatively expensive. Whole-wheat bread and other whole-grain cereals are perishable—a factor which adds to the cost of their distribution. The farmer in most cases can keep a cow and have a garden and an orchard; but on some poor lands, this is impossible. The city dweller is always dependent on the market for the variety of foods available to him and for the amounts which his dollar will purchase.

Families with incomes below a certain level must have assistance in tangible form if they are to secure the foods which provide an adequate diet. Assistance may take the form of a money dole, or it may involve the direct distribution of food. Experience has shown that money payments, as a rule, are ineffective. Distribution may be accomplished by means of tokens or stamps, good only for the purchase of food and not interchangeable. The Food Stamp Plan of the Surplus Marketing Administration has succeeded amazingly. I was told by a physician in New York that the clinical complexion of the clientele in a large dispensary changed dramatically after the Food Stamp Plan was introduced in that community. Before its adoption, almost every patient was overweight or underweight. (And I may say that overweight is as common a symptom of malnutrition as is underweight.) Many of the patients also presented other signs of malnutrition. After the adoption of the stamp plan, the appearance of more than half the patients decidedly improved. Indeed, one of the women patients declared, "Doctor, I'm beginning to live again!"

Another way of supplementing the diets of low-income families is to distribute food in kind. This can be done by some arrangement for communal feeding. The school lunch program, so long in operation in this country, has proved its value. Sir John Orr, Director of the Rowell Research Institute in Aberdeen and Director of the Imperial Bureau of Animal Nutrition, recently wrote from England that when the school-day diets of malnourished children were supplemented with milk and other protective foods, their ability to learn markedly improved. In a private school in Connecticut, where malnutrition had not been conspicuous before, the average grades rose 10 percent when special attention was given to the nutritional adequacy of the food served.

Similar methods of improving the nutrition of industrial workers have produced encouraging results in Britain, according to Orr. The introduction of supplementary meals in factories has been followed by an increase in production and a marked reduction of accidents.

A method of attack of special value is to improve the nutritional qualities of certain staples, which, because they are inexpensive, form an unduly large proportion of the diets of families with small incomes. It is almost impossible, even for experts,.to plan nutritionally good diets costing less than 20 cents a day when the sugar, flour, rice, and edible fats have had most of the minerals and vitamins removed by methods of refining. In some foods, all of these valuable elements have been lost.

It is here that the several food industries must mobilize. Happily and to the eternal credit of the milling and bread industries they now have improved their products in accordance with the recommendations of the National Research Council's Committee on Foods and Nutrition. What has been done may not represent the ideal solution of the flour-bread problem, but neither in my opinion does any other course available today. Brown bread has never been acceptable to more than a very small number of the population and for many persons the irritative action on the bowel of the bran contained in undermilled flours is undesirable. The miller, in time, will be able to present us with a white flour, so made that it retains most of the vitamins and mineral values of wheat. But, until he learns how to make such a flour, and that will take time, addition to plain white

flour of those nutrients which the National Research Council's Committee on Foods and Nutrition has prescribed for flour and breads labeled "enriched," will do much to facilitate the planning of good diets.

Many uninformed persons have blamed the food industrialist for our diet problems. The criticisms in large part have been unintelligent, misleading, and grossly unfair. Modern methods of processing were developed before there was knowledge of vitamins and the methods contributed importantly to improving the sanitary quality of foods. The methods also have provided products with better cooking qualities. In some processing methods, the vitamins are better preserved; in others, they are lost, together with other nutritive essentials. Before altering accepted procedure, the food processor, like the physician, demanded proof that human diets needed changing. Only recently has the evidence convinced him.

Nutritionists have been aware of a shortage in diets of vitamin A, calcium, and iron. The natural food sources for these are the green, leafy vegetables, milk, and butter. Many people obtain too few of these. Unable to purchase butter, they use instead either vegetable or animal fats which carry no vitamin A and may be lacking in other nutritional values. Something must be done to improve the nutritive qualities of the vegetable and animal fats, as now distributed. A problem the food industry must face is the need for larger distribution of milk than now obtains. The nutritional inadequacies of sugar create difficulties. Many diets are inadequate in protein. A wider distribution of lean meats and of leguminous proteins such as are contained in the peanut or the soybean would be advantageous.

It would not be appropriate here to elaborate further on individual aspects of the problem. I have mentioned some of them only to illustrate that much lies beyond the physician's sphere of activity. Success in the nutritional campaign demands leadership from many groups. The responsibility indeed is shared by all of us. Viewed selfishly, it is as much to my interest as to my neighbor's that he and his children be well nourished, if only for the reason that today all of us need, as never before, the assurance that comes from united strength and well-being.

Fortunately, an army of women, trained in schools of home economics, is already in the field. They have been there for several years, holding the front, so to speak, with almost no support and very little appreciation from the rest of us. The job of feeding the family is not woman's work alone, as men so often have supposed. Responsibility for the health of the family is as much that of the husband as the wife. The county agent, the Farm Security agent, and others in the agricultural service have left too much to the home demonstration people. Encouragement of home gardening and a family supply of milk and poultry is much more the responsibility of the men in these services than has been recognized.

One division of the nutrition army already in the field is composed of dietitians. They are invaluable assistants to physicians. We frequently are unable to devote the necessary time to teaching patients how to put in practice what we prescribe. Dietitians receive excellent training. Their numbers need augmenting to permit their wider employment in maternal and child health centers, in community feeding projects, in dispensaries, and as teachers of nutrition in many other situations.

The dental profession has been creditably active in nutrition, sometimes with greater zeal than wisdom. More emphasis on the fundamentals of nutritional physiology is desirable in schools of dentistry, as it is in schools of medicine. Nurses likewise ought to receive more training than they do in the principles of sound dietetics and nutrition.

The machinery for government regulation of foods was devised to prevent the sale of spoiled, adulterated, or misbranded foods. With notable exceptions in certain bureaus of the Department of Agriculture, little attention has been given to the nutritive qualities of human foods. The interest in general has been more in protecting pocketbooks than health. Also, unhappily, some food legislation has discriminated in favor of special interest groups with large political influence, to the detriment of the public at large. Here also criticism must be tempered with appreciation of the fact that proof of damage done has only lately been presented. Our legislators and public administrators are now hearing about nutrition for the first time, and from now on a change in emphasis may be anticipated—more attention to nutritional needs by administrators and by legislators, greater resistance to political pressures that affect unfavorably the nutritional needs of the people.

Last to be named, but foremost in importance, in this army which now is mobilizing on the nutrition front, are the people in research, the pioneers with the courage and what else it takes to scout in advance of the main forces, to locate the enemy and establish outposts. Nutrition, as I have said, is a newcomer in the ranks of science and much remains to be learned about it. Other vitamin activities are yet to be discovered; a number of vitamins await isolation. More knowledge must be had about the chemical mechanisms involved in these activities, about the dependence of one vitamin on another, and about relationships between vitamins and the various salts. A new world awaits exploration.

We are mobilizing now for a military emergency, mobilizing on many fronts. The outcome, if war is prolonged, will be determined in large measure by what we do with our foods.

In summary, I again express my confidence that the physician, aware of the seriousness of the problems presented by nutrition, will cooperate in the campaign for better nutrition with the same zeal he has exhibited in other public health activity. In the application of nutritional knowledge to the treatment of disease, his leadership must be sought and recognized. The over-all problem of national nutrition is beyond the physician's immediate sphere of action, but its solution will be the more speedily attained if his sympathetic support becomes an integral part of the program.

The campaign for better nutrition is complicated by cultural, social, and economic problems. The principal battles of the army of nutrition will be fought in fields of education, economics, and industry. Guidance can be provided by research, but the success of the campaign will depend on the effort of each of the several groups with special trainings that now are gathering for action.

We must come to recognize as a Nation that every one of us individually carries a responsibility for the welfare of our fellow citizens. May we always hold as an ideal that this Nation will some day be a Nation of buoyantly healthy people.

The nine sections of the Conference, made up of specialists in the various fields involved in this national planning, met in special sessions and on the last day of the Conference reported the results of their deliberations.

REPORTS OF SECTIONS

Section I—Research and National Nutrition Problems

Chairman: E. V. McCollum
Secretary: J. Ernestine Becker

The discussion in meetings of this section turned upon all the principal lines of inquiry in the field of nutrition. It was agreed by

the members that our knowledge, though still incomplete in all these lines, is sufficiently extensive to make possible several steps: The formulation of adequate dietaries at different cost levels; the recognition of a number of specific types of malnutrition; the conservation of nutrients in foods; and, in the case of several of the vitamins, the utilization of synthetic products to supplement deficient dietaries.

The specialists participating in this section agreed that further research is urgently needed and presented to the Conference the following outline of what should be sought:

(*a*) Improvement of presently known chemical and biological procedures for estimating the amounts of the essential nutrients in foods and their physiological availability.

(*b*) More refined techniques for the detection of nutritional deficiency states, especially in the subclinical degrees of intensity.

(*c*) More precise determination of the optimum and minimum requirements of human subjects for each of the nutrients, as influenced by age and physiological status (including pregnancy and lactation), and those factors which affect their utilization.

(*d*) Study of problems relating to the nutritional needs of the individual as influenced by constitutional inefficiencies, by suboptimal nutrition, by disease and convalescence.

(*e*) Studies directed toward clear definition of the physical status of the individual.

(*f*) Study of all factors affecting the nutritive value of foods and their preservation during the interval between production and consumption.

(*g*) Study of methods of preparation of foods for consumption so as to avoid losses of nutrients.

(*h*) Food habits and methods and effects of changing them.

The section moved to appoint a committee to survey existing facilities in all the universities, agricultural and land-grant colleges, or other laboratories of the country, fitted to carry out substantial portions of the general program of research outlined in the report.

Section II—Economic Policy and Social Responsibility as Related to Nutrition

Chairman: Lucy Gillett Co-chairman: Hazel Kyrk
Secretary: Hazel K. Stiebeling

The discussion in the meetings of this section stemmed from the recognition that among millions of Americans insufficient income is the root of their inadequate scheme of eating. The committee members opposed reduction in Federal nondefense expenditures for employment and relief in the coming fiscal year. They stressed the necessity for long-range planning to offset fluctuations in economic and defense activity and to anticipate the readjustments which must be made when the emergency is over.

The section recommended that the Federal Fair Labor Standards Act be extended to include those now excluded, and that the Social Security Act be extended to include domestic and agricultural workers,

especially those employed on commercialized and factory-type farms.

This section expressed itself as favoring among other things the maintenance of free collective bargaining among all workers, the elimination of barriers against the employment of Negroes and other minority groups whose nutritional problems are acute by reason of very low incomes, the elimination of taxes on very low incomes, and provision for benefits to workers temporarily or permanently disabled on account of sickness or accident.

It was the consensus of this section that the Government should take the initiative in increasing the supply of protective foods and should encourage industry to bring on the market such low-cost, highly nutritious foods as soybeans, peanuts, and milk products, in forms acceptable to consumers. Surpluses on hand should be saved by suitable processing, if necessary by means of Government subsidies.

As the step beyond increasing the supply of protective foods, Section II recommended that essential foods be provided wholly or in part at public expense. This measure should include free school lunches, extension of the Food Stamp Plan to relief families and to other families whose incomes are inadequate for nutritious diets, and the extension also of Federal-local programs providing milk at low cost.

This section recommended in all a five-point program. The program included the services which education can perform, the need for reducing the costs of processing and distribution, and the necessity for further research, and this inclusion confirmed the recommendations of those sections which dealt particularly with these subjects.

Section III—Public Health and Medical Aspects of Nutrition

Chairman: James S. McLester Co-chairman: Richard Smith

Secretaries: W. H. Sebrell and Katherine Bain

This section met in two groups. Members of the section recommended to the Conference that State and local public health authorities should be led to recognize that they have a large responsibility in the efforts of their communities toward better nutrition. They urged that the subject of nutrition be called to the attention of medical and public health groups everywhere and that a closer cooperation between these groups be sought. They recommended that as acceptable diagnostic methods are developed in the field of nutrition the service be made available by departments of health to the practicing physician. This section further recommended the wider distribution and utilization of inexpensive foods of high nutritive value, and endorsed the action of the Committee on Foods and Nutrition of the National Research Council in sponsoring the enrichment of flour and bread.

Section IIIb considered particularly the nutritive requirements of pregnant and lactating women. This section took as a basis for

its discussion the table (which is here included) of daily allowances of nutrients released by the Committee on Foods and Nutrition. It recommended that this committee consider the desirability of adding vitamin K as an essential nutrient for women during the late period of pregnancy or for newborn infants within the first 24 hours of life. The section further recommended that lists be prepared and distributed widely of the kinds and quantities of food needed for the adequate nourishment of pregnant and lactating women and of children in the different age groups.

Chart of recommended daily allowances for specific nutrients [1]

Committee on Foods and Nutrition, National Research Council

	Calories	Protein	Calcium	Iron	A [3]	Thiamin (B_1) [2]	Ascorbic acid (C) [2]	Riboflavin	Nicotinic acid	D
		gm.	*gm.*	*mg.*	*I. U.*	*mg.*	*mg.*	*mg.*	*mg.*	*I. U.*
Man (70 kg.):										
Moderately active	3,000	70	0.8	12	5,000	1.8	75	2.7	18	--------
Very active	4,500	--------	------	------	-------	2.3	-------	3.3	23	(5)
Sedentary	2,500	--------	------	------	-------	1.5	-------	2.2	15	--------
Woman (56 kg.):										
Moderately active	2,500	60	.8	12	5,000	1.5	70	2.2	15	--------
Very active	3,000	--------	------	------	-------	1.8	-------	2.7	18	(5)
Sedentary	2,100	--------	------	------	-------	1.2	-------	1.8	12	--------
Pregnancy (latter half)	2,500	85	1.5	15	6,000	1.8	100	2.5	18	400–800
Lactation	3,000	100	2.0	------	8,000	2.3	150	3.0	23	400–800
Children up to 12 years:										
Under 1 year [4]	100 per kg.	3–4 per kg.	1.0	6	1,500	0.4	30	0.6	4	400–800
1–3 years	1,200	40	1.0	7	2,000	0.6	35	0.9	6	--------
4–6 years [6]	1,600	50	1.0	8	2,500	0.8	50	1.2	8	--------
7–9 years	2,000	60	1.0	10	3,500	1.0	60	1.5	10	(5)
10–12 years	2,500	70	1.2	12	4,500	1.2	75	1.8	12	--------
Children over 12 years:										
Girls:										
13–15 years	2,800	80	1.3	15	5,000	1.4	80	2.0	14	--------
16–20 years	2,400	75	1.0	15	5,000	1.2	80	1.8	12	(5)
Boys:										
13–15 years	3,200	85	1.4	15	5,000	1.6	90	2.4	16	--------
16–20 years	3,800	100	1.4	15	6,000	2.0	100	3.0	20	(5)

[1] These are tentative allowances toward which to aim in planning practical dietaries. These allowances can be met by a good diet of natural foods; this will also provide other minerals and vitamins, the requirements for which are less well known.

[2] One mg. thiamin equals 333 International Units; 1 mg. ascorbic acid equals 20 International Units (1 International Unit equals 1 U. S. P. unit).

[3] Requirements may be less than these amounts if provided as vitamin A, greater if chiefly as the provitamin carotene.

[4] Needs of infants increase from month to month. The amounts given are for approximately 6–18 months. The amounts of protein and calcium needed are less if from breast milk.

[5] Vitamin D is undoubtedly necessary for older children and adults. When not available from sunshine, it should be provided probably up to the minimal amounts recommended for infants.

[6] Allowances are based on the middle age for each group (as 2, 5, 8, etc.), and for moderate activity.

Dietary "Pattern"

Diets meeting the following dietary pattern were calculated for each of the categories in the allowances.

Milk, adults 1 pint, children 1½ pints to 1 quart.
Egg, 1 daily.
Meat, 1 serving (20 gm. at 1 year to 100 gm. for adult). (Calculated as beef.)
Vegetables, 2 servings. One green or yellow.
Fruit, 2 servings. One citrus or tomato and one other, as apple, prunes.
Potato, one or more servings.

Butter or fortified oleo (100–500 calories). (1 to 5 large pats.)
Cereals and bread, 2 oz., infants to 10 oz., adults, half of these quantities to be in whole or enriched cereal and bread. Calculated as minimum enriched.
Sugar, fat, etc., to complete calories.

Section IV—Nutrition for Workers in Defense Industries
Chairman: Frank Boudreau
Secretary: Carroll Palmer

The recommendations of this section were directed toward building up the nutrition of defense workers and those likely to become defense workers. It was recommended that supplemental feeding in factories be instituted wherever, in the light of our modern knowledge in nutrition, it was apparent that the diets of defense workers were not fully adequate. Where defense plants are constructed in areas lacking normal facilities, community feeding, with its advantages of economy and expert supervision, might be necessary. Approval of contracts for construction or expansion of defense plants should include consideration of the facilities for feeding the workers. Plans for distribution of protective surplus foods should take into account particularly families of low-income workers in defense industries.

This section was of the opinion that a proper definition of the problem necessitates studies in selected defense plants to determine the influence of diet on health, working capacity, incidence of accidents, absenteeism, and the psychological bases of industrial unrest.

The section recommended finally that the Governor of each State be asked to call a State conference on nutrition in defense. Such conferences were considered the necessary means of carrying on the work started in the National Nutrition Conference.

Section V—Methods of Education in Nutrition
Chairman: G. Dorothy Williams Co-chairman: Mildred W. Wood
Secretaries: Miriam Birdseye and Edna P. Amidon

This section recommended that professional and lay readers be given pre-service and in-service education in nutrition.

It recommended further that all State, local, and national groups provide educational material and otherwise help to make the most effective use of every medium of presenting information. These include news reels, documentary films, the radio, the press, town meetings, posters, exhibits, food demonstrations, and every activity or presentation by which knowledge of nutrition may be carried from mind to mind.

Section VI—Professional Education in Nutrition
Chairman: Lydia J. Roberts Co-chairman: John H. Musser
Secretaries: Thelma Porter and Marjorie Heseltine

This section met in two groups, the first of which discussed generally professional education in nutrition. This group recommended that

plans be made with the heads of various professional schools for (1) short refresher courses for workers now in the field, (2) special training courses for persons selected to act under supervision in emergencies as lay leaders, and (3) a stronger basic training to stimulate present and future students to specialize. More nutritionists thoroughly trained in the scientific background of nutrition and in its practical application are needed.

It was further recommended that in-service education and consultation with specialists in nutrition be made available to professional workers in that field and allied fields.

Section VIb considered particularly the training of physicians, dentists, and public health officers. This section in reporting to the Conference stressed the dearth of such professionals qualified to take an authoritative position in the field of nutrition. It advocated better training in this field for students of medicine, dentistry, and public health and extensive postgraduate courses for physicians, dentists, and public health officers. It emphasized the need for physicians and dentists trained in nutrition and experienced in recognizing the nutritional diseases to serve as consultants to teachers, social workers, public health nurses, nutritionists, and any others concerned with solving the problem. This section favored the establishment of nutrition clinics in association with professional schools where facilities for research and advanced training might be available.

The section urged that the problem be called to the attention of the Association of the American Medical Colleges, the American Medical Association, the American Dental Association, and the American Public Health Association. Pending action by these groups at their regular meetings, it was suggested that the deans of medical and dental schools and of schools of public health be called into conference.

Section VII—Nutrition Problems in Distribution and Processing of Foods

Chairman: Hector Lazo Co-chairman: L. V. Burton

Secretaries: Frederick V. Waugh and R. S. Hollingshead

This section advocated that agricultural production be adjusted to provide adequate supplies of those foods in which the American diet is deficient and away from those crops for which the export market has for the time being fallen off. It was specified that farmers must receive fair prices and fair incomes while these adjustments are being made.

Important to the budget of the low-income family is efficiency in the transportation, processing, and distribution of food products, and greater efforts along these lines were urged upon the food industry.

The section recommended that the Government continue its policy of vigorous enforcement of antitrust laws against those illegal prac-

tices which tend to raise food prices, whether they be in agriculture, industry, or labor.

In some instances, municipal, State, or Federal legislation include restrictions, not designed solely for the protection of the public welfare, which interfere with the ability to produce, process, and distribute foods. The section urged a judicious examination of all such laws.

The need for rapid methods for vitamin assay was stressed, and the recommendation made that the Federal Government designate tests now acceptable and develop further tests and methods from the viewpoint of the Association of Official Agricultural Chemists.

The section favored the addition of vitamins or minerals or both to those processed foods which, in the opinion of recognized nutritional authorities, are in need of enrichment.

The Processing Section recommended: (1) That the National Selective Service System be requested to recommend for deferment those technically trained men who are essential in the production of processed foods; (2) that the Office of Production Management give effective priorities to the food-processing industry for material and supplies essential to the production of processed foods and food accessories; and (3) that the United States Maritime Commission and the Transportation Division of the Office of Production Management give effective priorities for the transportation of materials and processed foods and the supplies and personnel necessary for their production.

It was further recommended that agricultural and trade groups be asked to set up a body to work with the government and with appropriate local organizations in attaining a successful program of nutrition.

Section VIII—Community Planning for Nutrition

Chairman: Howard McClusky Co-chairman: H. C. Ramsower
Secretaries: Margery Vaughn and B. W. Allin

This subject was considered in its rural and urban aspects by the two groups of Section VIII. The members, in reporting to the Conference, defined the nutrition program as a long-range program and urged that the work of arousing public interest and enlisting the aid of organizations should be directed to giving it this long-range character.

The members agreed that the unit of organization should be the neighborhood or some other natural community subdivision and that the State nutrition committee should be responsible for assisting in the development of local programs. The Federal agency responsible for the national nutrition program should make available to State nutrition committees one or more consultants for assistance as desired. The same agency would serve as a clearing house for the preparation and distribution of educational materials.

Section VIIIb recommended that the State nutrition committee designate the individuals, groups, or agencies that should assume

responsibility for getting the community programs under way. The undertaking would call for the correlated action of existing agencies and would involve these steps:

(*a*) Appraising needs and resources of the county and community.
(*b*) Formulating the county and community program.
(*c*) Getting action on the program.
(*d*) Keeping the public informed on progress made.

Section IX—Nutrition Problems in Group Food Service

Chairman: Katherine Ansley Co-chairman: Alberta MacFarlane
Secretary: Melva Bakkie

This section had in mind those who "eat out," students at boarding schools, travellers, and all others for whom group food service is run. Its recommendations were directed toward assisting food operators in institutions and public eating places to know how to judge the nutritional adequacy of dietaries and how to increase food values without increasing costs.

The section recommended that established food allowances be translated into quantitative practical terms for convenient use. Further recommendations included such measures as the use of surplus commodities, especially milk, in low-cost group feeding, and experimentation with such products as dried and evaporated milk, frozen and dried eggs, soybean and peanut products as a means of increasing food value without increasing cost.

It also recommended that Federal, State, and local programs include training of cooks and other members of food-production staffs as part of the contribution to the national defense.

RECOMMENDATIONS TO THE PRESIDENT OF THE UNITED STATES

The National Nutrition Conference, pledging full support to the President in mobilizing national resources to meet the emergency, made the following recommendations, based upon the reports of its sections:

I. The great and sometimes startling advances in our knowledge of nutrition in recent years have made it clear that the food an individual eats fundamentally affects his health, strength, stamina, nervous condition, morale, and mental functioning. In view of these proven facts, it is vital for the United States to make immediate and full use of the newer knowledge of nutrition in the present national emergency. To neglect this aspect of defense would be as hazardous as to neglect military preparedness.

II. The newer knowledge of nutrition should be used not only for the benefit of our armed forces, who must of course be adequately fed, but for that of all workers in industries directly and indirectly related to defense, and also for the civilian population as a whole. Wars are won or lost according to the health, courage, and calmness of whole populations and their ability to exert themselves to the utmost, and this is particularly true in modern total warfare.

III. Recent dietary studies among large representative samples of the people of the United States, clinical studies among smaller groups, and the examination of men called up for military service show clearly that poor diets and undernourishment are widespread in this country. The conditions revealed corroborate the scientific findings of the newer knowledge of nutrition. While these conditions offer no ground for alarmist statements, they are serious enough to be a genuine cause of weakness in the present national emergency and to warrant national attention and concerted action. A widespread disease epidemic would receive such attention immediately. Undernourishment is more insidious and less obvious in its effects, but it is not less harmful when all the results are considered.

IV. Few problems in the field of public health are simple, and that of undernourishment is particularly complex. It has not only medical but social, economic, and psychological aspects, and to attack it on a national scale will require peculiarly widespread and whole-hearted cooperation on the part of all elements in our population. This Conference urges the following lines of attack as particularly important:

(1) The use of the recommended allowances of calories, protein, and certain important minerals and vitamins, prepared by the Committee on Foods and Nutrition of the National Research Council, both as the general goal for good nutrition in the United States and as the yardstick by which to measure progress toward that goal. It should be clearly recognized that these recommended allowances represent the best knowledge now available, and that they will undoubtedly be modified as more knowledge accumulates.

(2) Translation of these allowances, and other similar technical material, into terms of everyday foods and appetizing meals suitable for families and individuals at different economic levels in such a way that the newer knowledge of nutrition can be applied simply and practically, in every home, and in accordance with the food preferences of the family.

(3) Vigorous and continuous research to add to our present knowledge of the nutritional needs of individuals, the nutritional status of groups in the population, the nutritive content of everyday foods, and the effects of various methods of processing, storing, and cooking in their nutritive value.

(4) More widespread education of doctors, dentists, social-service workers, teachers, and other professional workers in the newer knowledge of nutrition. At present this knowledge, especially in its practical applications, is familiar to far too small a group even in the professional field.

(5) The mobilization of every educational method to spread the newer knowledge of nutrition among laymen by means of the schools, motion pictures, the radio, the public press, home and community demonstrations, and all other suitable means.

(6) Mobilization of all neighborhood, community, State, and national organizations and services that can contribute in any way to raising the nutritional level of the people of the United States. Many existing organizations are available for this purpose. How they can be mobilized to cooperate most effectively will depend on local situations. The State nutrition committees can perform an especially useful function in organizing this effort.

(7) Vigorous and continued attack on the fundamental problems of unemployment, insecure employment, and rates of pay inadequate to maintain an American standard of living. It has been abundantly proved in many cases that undernourishment and ignorance are twins born of the same mother—poverty. The newer knowledge of nutrition should be a powerful stimulus to greater effort to alleviate and eventually eliminate poverty.

(8) Full use of any practical devices, such as the so-called Stamp Plan, free school lunches, and low-cost milk distribution which will bring nourishing, ade-

quate meals to those who could not otherwise afford them, and at the same time help to distribute food surpluses at a fair return to the farmer.

(9) Efforts to improve food distribution, including processing, marketing, packaging, and labeling, to bring about greater real economies for the consumer. These efforts would include vigorous prosecution of illegal practices under the antitrust laws and the laws relating to unfair trade practices wherever such practices result in unjustifiable increases in food prices.

(10) Encouragement in all practical ways of greater production by agriculture of the foods needed in more abundance, according to the newer knowledge of nutrition, in the average American diet. These foods include milk and milk products, eggs, vegetables, fruits, and, in the case of many families, lean meats.

(11) Equally, encouragement in every practical way of more production for home use by rural people, especially those at low income levels. Large numbers of farm families can greatly improve their nutritional status by making more complete use of the resources on their own farms.

(12) The "enrichment" of certain staple food products, such as flour and bread, with nutritive elements that have been removed from them by modern milling and refining processes. Pending further developments in the milling of grains so as to retain their full, natural nutritive values, enrichment is an economical way to improve American dietaries almost universally, without interfering with deeply ingrained food habits. The method, however, should be used with discretion and only on the basis of findings by medical and nutritional experts.

V. These broad recommendations are made as the basis for a national nutrition policy and an action program that can reach down to every community, and if possible every individual, in the land in the present emergency. But the Conference also wishes to put on record its belief that such a policy and program have implications that go beyond the present emergency.

At the closing session of the Conference, Surgeon General Thomas Parran addressed the members. The text of the Surgeon General's remarks follows:

The Job Ahead

This is a grave hour in our Nation's history. We have met here at the request of our President, to contribute our knowledge and our effort to an urgent defense task. We have been asked by our Commander-in-Chief to tell him what we can do to make America strong by making Americans stronger for whatever perilous task may lie ahead. An answer has been given in our approval of the reports of the ten sections, given here today. In summary, our answer is that, given the national will to do it, we have the power to build here in America a nation of people more fit, more vigorous, more competent; a nation with better morale, a more united purpose, more toughness of body, and greater strength of mind than the world has ever seen.

This total result can be accomplished only by putting to work all of the scientific knowledge we have for the nutrition of all our people. We have the capacity for agricultural production. We have the soil fertility, thanks to our soil conservation programs in recent years. We have the educational machinery. We have the food manufacturing and distribution facilities, with leaders keenly aware of their social responsibility. Throughout the Nation we have a great surge of desire to do something solid for defense. Each of us wants to build better and more strongly the human bulwarks of democracy, which is the one thing we defend. These great assets in food production, distribution, education, social awareness,

and patriotism can be canalized, through science, toward our goal of nutrition to lift our level of achievement. If we attain this goal, what will be the results?

In the past two decades there have been breath-taking discoveries on many nutritional fronts. To find a parallel to this swift advance in knowledge we must go back to the epoch-making time of Pasteur, whose germ theory of disease made possible a half-century of progress against preventable infections. Without Pasteur and his co-workers and disciples, mankind still would be plague-ridden. He made our civilization vastly different. Tomorrow's civilization can be made vastly different, and far better than today's, if we put to work now what we know now about the nutrition of human beings.

In the past half century we have added 20 years to the average span of human life, largely by saving the lives of babies and of young people. But life expectancy for those of us beyond the age of forty has not increased since Pasteur's time. On the contrary, many diseases have increased because more of us grow old enough to acquire them. Deaths have increased from cancer, heart conditions, kidney diseases, mental illness, in fact, from all of the so-called degenerative causes. It is easy to say that this is the strain of modern life. Yet every disease, every malfunction of an organ, results from a derangement in the functioning of the individual body cell. The individual cell functions properly if it is properly fed, and if it is not killed by the invasion of bacterial, virus, or chemical poisons, or by endogenous toxins. The food available to each of the body cells probably determines to a large degree the health of that cell, its proper functioning, its reciprocal relations with other cells, which make up organs and systems of the body.

A machine wears out prematurely if not properly fueled and lubricated. It is a reasonable hypothesis that the human machine wears out prematurely if it is not properly nourished. Certain it is that normal human nutrition requires a total of at least 40 different food substances—carbohydrates, fats, minerals, proteins (in the form of amino-acids), and vitamins—of which many have been isolated and reproduced as synthetic crystals. Not only does the body require these diverse food elements, but we know that the elements are required by the body in a certain definite ratio of one to the other. Infectious disease, treatment with certain drugs, and perhaps other causes as yet undiscovered, upset the normal body demand for certain food elements.

The science of nutrition is about as young as the science of aviation. We do not know all the answers in either field. But as much, relatively, is known about what nourishes a human body as is known about what gets a heavy machine up in the air and to its destination safely. The difference is that far less of the nutritional knowledge is put to work.

This Conference has given us enough basic facts to stimulate national thinking and speed united action. These facts have been considered by agricultural economists, by educators, by food processors and distributors, by community leaders, by family doctors. Blueprints for national action have been drawn. The facts make clear that while nutrition is an individual and family problem, it is also a community and a national problem.

For the first time, the top experts in the Nation have drawn the specifications for a diet adequate for good health—a "gold standard for nutrition." Here we have the blueprints. They represent no narrow list of foods, but a wide choice that can be purchased cheaply anywhere in the country, yet which will provide for men, women, and children the nutrition essentials for life and buoyant health. These blueprints will have meaning only if each one of the 130 million of us can and will translate the specifications into a wiser selection of what goes into our stomachs every day.

It may seem strange that we have not yet determined the full nature and extent of our nutritional problem. Facts presented here show that only a small proportion of the undernourished have acute symptoms of disease, perhaps only one in ten. Like an iceberg, nine-tenths of our malnutrition, and the most dangerous part, is under the surface. Yet experimental and clinical evidence piles up ahead of exact laboratory tests to show that much ill health, mental and physical, can be relieved dramatically by the right food. Of even more importance is the evidence that by the supplementary feeding of groups who were getting a diet to start with which once would have been considered adequate, growth, strength, resistance to disease and above all, morals, are swiftly promoted.

Doctor Sherman has told us that if we replace an average diet with an adequate diet, we get a 10-year increase in the active, virile life span. This would mean more in terms of human longevity than to wipe out cancer as a cause of death. We have been told that through nutritional science we can eliminate the "half-health, half-strength, half-happiness" which results from a diet not quite good enough.

Even though we do not know the full extent of the nutritional problem in the United States, as President Roosevelt has told us "every survey of nutrition, by whatever method conducted, in whatever part of the country, shows malnutrition to be widespread and serious." Studies of family diets by the Department of Agriculture in all income groups of the Nation show that one-third of our people are getting food inadequate to maintain good health. Less than one-fourth of us are getting a "good diet," even when measured by the old standards which are lower than the "gold standard" presented to us by Doctor Wilder's committee. Some people can't afford to buy the food they need; others spend their limited food budget unwisely; still others have fixed and faulty food habits. We Americans want good health to be the heritage of all, on as democratic a basis as the suffrage itself. We want no property qualification for health.

Secretary Wickard and Secretary Berle have told us that, in the world struggle, food is a basic weapon. Here, we happen to have plenty of fertile land to supply every element of a full and adequate diet to the present population and any prospective increase. This is true, in spite of past exploitation of agricultural resources. During the last war we tried to raise wheat on land fit only for grazing. It will require a generation of careful restoration to eliminate the dust bowls we created thereby. From the richest valley in the world, the Mississippi, we have exported the soil in the form of cotton, and created an economy of poverty, of tenancy, of pellagra, of anemia and hookworm disease. The rest of the country must help to restore and the job will take long years.

We have been unwise on other fronts. Nature puts into the foods we eat the vital elements necessary for balanced health. Many of them have been depleted through our zeal for over-refining and by modern cooking methods.

The Conference has been told that one-half of our fuel, the calories we eat, is in the form of bread and sugar. Add to this the refined fats, and two-thirds of our energy intake is in the form of "inert calories," which furnish fuel and nothing else. From the remaining third of our diet we must get the vitamin B complex and the minerals needed to burn up the inert calories. This has been hard to do during the past years. Bread, during long centuries, has been the "staff of life." Until recently we have made it a very frail and feeble reed by "scalping" out of the wheat berry most of the vitamins and minerals which the good Lord put into it for our protection. Year by year, too, our consumption of sugar has increased. White sugar is a source of fuel, nothing else. It does not carry the vital elements necessary for its use in the body.

To restore bread to its traditional virtue which made it the staff of life, the millers and bakers of the country have revolutionized their industries. In the

new flour standards, announced at this Conference by Federal Security Administrator McNutt, the Nation is assured of a stronger staff in the new "enriched flour." This will be attained either by conserving the vital elements naturally present in wheat, through longer extraction, which means using more of the wheat berry, or, if the public continues to demand pallid bread, the most essential elements will be restored to highly milled white flour without changing its color. Whichever you choose, you get a more healthful food. Choose one of them.

Modern diets are deficient, too, in other respects. To give to all what all of us need nutritionally, we should increase by nearly 50 percent our national production of milk and milk products. One of the most valuable foods, dried skim milk, now is used largely for poultry and stock feed. In fact, we have given our livestock the best parts of many foods. This Conference has pointed out the ways we can let our children get more of their share.

During the past decade, the United States has produced what we have called a "surplus "of agricultural products. Very wisely we have built up an "ever-normal granary" of corn and wheat to fend against droughts and other emergencies which would cut down supply or increase consumption. Wisely, also, we have conserved the soil and helped farmers to stay on the soil. Some of the most hungry of our needy families have been able to get a better diet through the Food Stamp Plan. It has helped them, and it has made good use of some of our surplus foods. About half of our needy school children get at least one good meal a day for 5 days a week in the free school lunches.

Actually, however, these important programs have been designed to take surplus foods off the market, not primarily to meet nutritional needs. The reports made to this Conference demonstrate that if full domestic food needs are met, we do not have any real surplus of agricultural production, except of wheat, cotton, and tobacco. If we add the crying needs of Great Britain to our own requirements, if all of our people are to have a thoroughly good diet, we are faced with a shortage of animal proteins, of milk and milk products, and of the legumes. To meet this shortage now and to take our proper place in the half-starved world after the war, we must give direction to our farm output. We cannot afford now to use as many acres as before in growing cotton, wheat, and tobacco, for which there is no market now or in prospect immediately after the war. This is obvious when both ourselves and the British need the concentrated protein foods which these acres can produce. We can take care of all of our own needs and the urgent food needs of the British too, but not on the basis of agricultural "business as usual." "Food will win the war" was the slogan in 1917–18. Food lost that war for Germany. We must make extraordinary efforts to see to it now that the tables are not turned.

In practical terms, we need every drop of milk, every egg, every legume, every pound of meat and of fish we can produce for Anglo-American nutrition. Add to this substantial quantities of animal and vegetable fats, fish-liver oils, and certain vitamins. I believe that the program of the Department of Agriculture, explained so clearly by Secretary Wickard, which will convert most of our ever-normal granary of feed into concentrated human protein foods will go far to get the results so urgently needed. We may be obliged to go even further during this period of emergency.

Those of us who have participated in the discussions of the past three days are confident that this is the "Action Conference" which our chairman demanded. The major directions have been charted. We go back to our accustomed tasks determined to realize the objectives.

I see in this Conference a "marriage of agriculture and public health in the interest of national nutrition," which was foretold by Stanley Bruce, now the Australian High Commissioner in London, at a nutrition meeting of the League

of Nations in Geneva some years ago. Elaborating his figure of speech, perhaps one may say that industry is the best man at the ceremony, and our nutritional experts are the parents of the bride and groom.

There has been complete agreement with the objective of the Conference stated in different language by the President, the Vice President, and the chairman: "To Build a Stronger Race Through Good Food."

Our recommendations state our determination to do this through the united efforts of agriculture, economics, public health, nutritional science, industry, and education. First of all, we should continue our search for knowledge. Greater support must be given to scientific research in nutrition by the Government, by the universities and foundations, and by the industries concerned.

Through soil conservation we can grow better food, more of it, and richer in vital and mineral elements. Through the direction given by governmental aid to agriculture we can encourage the production of more of the foods we need for defense, less of those not needed.

For our poorest people, all of those on relief, I urge an extension of the Food Stamp Plan. I suggest also that better nutrition of human beings rather than removal of surplus products should be the consideration that shapes the job.

I would have you consider also that if war should make it necessary for us to conserve certain foods more needed by our allies and ourselves, the administrative machinery of the Food Stamp Plan could be put into reverse overnight in order to insure the most equitable consumption of such foods in proportion to need, not in proportion to buying power.

If food stamps or a comparable plan were in operation all over the country, it could be extended to other nutritionally needy families, who now are without the foods essential to good health. Well-planned school lunches are another case in point. Now available only to one-half of our needy children, all such children should get them. Milk is such a strategic food that every family must be given an opportunity to get what is necessary for growth and health. The same is true of the citrus fruits.

Then, too, we must remember the great strategic importance of food. Both Mr. Wilson and Mr. Berle have told us how food, because of its impact upon economic conditions and the morale of a people, has been used by aggressor nations as an instrument of war, an instrument for subjugating whole populations.

Consider, further, the possibilities which food offers as a foundation stone in an after-war world economy. Present Anglo-American cooperation in food for defense, involving, as it should, intimate cooperation between the United Kingdom, the British Commonwealths, the United States, and the other American Republics, may lay the basis for a world policy to meet most effectively this elemental human need. This is only a hope of the future. Toward the realization of that hope, our immediate domestic tasks having to do with food and nutrition will point the way.

The doctors here will see to it that the whole medical profession keeps abreast of the newer knowledge of nutrition, and that it takes its part in community leadership to put this knowledge to work.

The State nutrition councils will multiply this conference by forty-eight times, through the organization of comparable State conferences, to bring your recommendations to each of the 3,000 counties in order to get action on every front.

The leaders in food manufacturing and distribution will lend their facilities and their great influence to get the maximum distribution of those foods now most deficient in our national dietary. Greater volume will make it possible to cut processing and distribution costs. Other food industries will follow the lead of the millers and bakers in improving the nutritional value of their products.

The farmers will divert acres now growing cotton, tobacco, and wheat into pasture for dairy herds, home gardens, peanuts and soy beans, green vegetables, fruits, tomatoes, cows, and sheep and pigs and chickens and eggs. To provide a good diet for all Americans will mean an added 35 to 40 million acres in production in foodstuffs and a higher farm income.

The food and nutrition experts will continue and increase their efforts. Theirs must be the responsibility for teaching citizens what a better diet will mean to every American, in terms of a strong body, a more alert mind, greater resistance to disease, longer life, greater vigor, and a better chance for happiness. No longer will they be as a "voice crying in the wilderness." They will have strong reinforcements from many directions.

Substantial governmental aid to agriculture will be directed, I hope, toward adapting our productive capacity more directly to meet the nutritional needs of our people. The Nation can afford to be generous with its farmers.

If our farmers go to work to see that all of us are properly fed, themselves and their families included, the rest of us will return the investment to them many times over through greater production and greater prosperity.

These are great objectives. I believe the Conference is unanimously for them. But regardless of the desirability of a result, or the amount of good will involved, things do not get themselves done. I hope that when he has received the report of this Conference, the President may see fit to make this task the sole responsibility of a competent body to act through the Coordinator of Health, Welfare, and Nutrition as an operating agency to apply what we know in scientific nutrition to the human needs we have in this unlimited emergency. I would hope that science, education, industry, and all Government agencies directly concerned will share in the responsibility for the job ahead.

This whole job ahead can be done, and it will be done. It will constitute news of historic importance, of far more importance on the constructive side than the capitulation of France or the over-running of Greece have been destructive to our hopes for the democracies. The building up of our own people to a level of health and vigor never before attained or dreamed of, the working out with the British Empire, the American Republics, and other democracies of far-reaching cooperative plans for the pooling of the food resources of the democratic world—this may prove to be the one good thing to come out of the war when we have done our share to win it.

But let not the hopes of the future obscure the immediate task. Through the efforts of all of us, expressed through our servant, government, and through our collective personal efforts, we shall begin now to see that everyone in the America of the future gets an equal opportunity to be born and reared in a healthful environment, and to secure a diet that makes for enduring strength. Only in this way can each bear his proper part in this country of free men.

Today we are preparing to defend, not so much the square miles of land that represent the 48 States, our territories and possessions, nor an island here, or the bulge of a continent there, but the men, women, and children who are the United States. We must be willing, yes eager, to sacrifice comforts, convenience, money, even life itself, in order to insure our freedom and the freedom of our children to choose our own and their own way of life.

This Conference has shown clearly the ways in which we can put our food knowledge to work to build a new, a stronger, a more intelligent, a more competent race. Yes, *food will build a new America.*

All of us today are conscious of the grave task lying before us. The President has declared a state of unlimited national emergency. We shall need in the days to come rugged health and courage such as the world has never seen. The magnitude of our effort for this war is only the beginning of our historic task.

After this war, when cities and civilizations lie in ruins and the democratic impulse in men's hearts toward human brotherhood is smothered with hate, all the strength and courage that America can muster will be needed for the rebuilding of a shattered world. We Americans must be conscious of our destiny—for America is the last great hope on earth.

CIRRHOSIS OF THE LIVER IN RATS ON A DEFICIENT DIET AND THE EFFECT OF ALCOHOL [1]

By R. D. Lillie, *Senior Surgeon*, F. S. Daft, *Senior Biochemist*, and W. H. Sebrell, Jr., *Surgeon, United States Public Health Service*

Cirrhosis of the liver in rats on a diet containing selenium has been reported from several laboratories (*1*). Connor and Chaikoff (*2*) described portal cirrhosis in the livers of 4 of 16 dogs that received a high fat diet and large doses of alcohol. György and Goldblatt (*3*) mentioned localized cirrhosis in 2 rats of a large number kept on a deficient diet. Since the present experiments were begun, several more reports of hepatic cirrhosis have appeared in the literature. Rich and Hamilton (*4*) have described liver cirrhosis in rabbits produced by a dietary deficiency and prevented by yeast; Chaikoff and Connor (*5*) have described the production of liver cirrhosis in dogs on a high fat diet without alcohol; and Webster (*6*) has mentioned hepatic cirrhosis in rats which could be prevented by the administration of large amounts of yeast or molasses. Recently, Earle and Victor (*7*) have described cirrhosis of the liver of rats caused by excess dietary cystine.

The present investigation was undertaken to test the effect of the ingestion of alcohol on rats receiving a diet known to have certain deficiencies.

EXPERIMENTAL

Sixteen young albino rats (22 days old) and 16 old albino rats (17 to 18 months old) were divided into four groups of 8 rats each. The rats of one group were given water ad lib. and stock diet No. 516, the composition of which is given in table 1. The rats of the second group were given diet No. 516 and alcohol, approximately 20 percent by volume, ad lib. in place of drinking water. Those of the third group were given water ad lib. and diet No. 349, the composition of which is given in table 2. The rats of the fourth group were given diet No. 349 and approximately 20 percent alcohol ad lib. in place of drinking water.

[1] From the Divisions of Pathology and Chemotherapy, National Institute of Health. Presented at the meeting of the Federation of American Societies for Experimental Biology, Chicago, Ill., April 19, 1941.

TABLE 1.—*Composition of stock diet No. 516*

Whole ground soft wheat	28
Whole ground yellow corn	28
Ground green lead alfalfa	10
Whole milk powder	25
Dried pork liver	6
Cod liver oil	1
Bonemeal, ground	1.5
Sodium chloride	0.5
	100.0

TABLE 2.—*Composition of diet No. 349*

Leached casein	4
Salt mixture (Osborne and Mendel)	4
Cod liver oil	2
Wesson oil	3
Brewers' yeast	5
Starch	82
	100.0

Of the 16 young rats, 2 died during the experiment, 1 in group 2 after 5½ months and 1 in group 4 after 10 months on experiment. The remaining 14 were sacrificed after 1 year. Only 7 of the 16 old rats survived the 1-year experimental period and, of these, 5 received the stock diet (2 in group 1 and 3 in group 2). The other 3 old rats on diet No. 516 died within 2 months of the beginning of the experiment. Of the 4 old rats in group 3, 1 died after 10 months and 1 after 11 months, the remaining 2 being sacrificed at the end of 1 year. Three old rats in group 4 died within 4 months and 1 after 11 months on experiment. No liver pathology was found in the rats which died early and only those surviving 10 months or longer will be considered. They are distributed as follows:

	Group 1—diet 516 and water	Group 2—diet 516 and alcohol	Group 3—diet 349 and water	Group 4—diet 349 and alcohol
Young rats	4	3	4	4
Old rats	2	3	4	1

RESULTS

None of the rats on stock diet No. 516 showed pathologic change of the liver.

Three of the 5 older rats on diet No. 349 showed precirrhotic liver changes. One of these 3 was the rat receiving alcohol (group 4).

Of the 4 younger rats on diet No. 349 receiving water, 2 showed moderate hepatic cirrhosis, 1 showed precirrhotic hepatic pigmentation, and 1 showed no significant lesions. One of the 4 receiving alcohol showed rather marked hepatic cirrhosis, 1 moderate, and 1 moderate to slight cirrhosis, and 1 a precirrhotic state. Three selected individual protocols, showing rather marked cirrhosis, moderate cirrhosis, and precirrhotic pigmentation, follow.

Liver shows quite marked coarse trabeculation by broad bands with delicate blue fibrils staining with picro aniline blue, little material staining red with Van

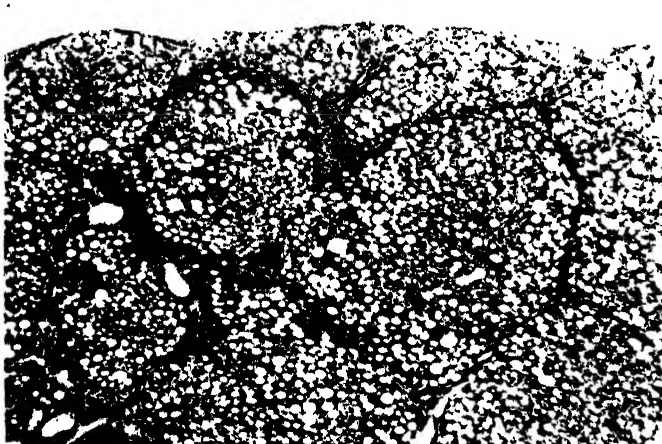

FIGURE 1 (above) and FIGURE 2 (below).—Gross and microscopic appearance of liver from rat on diet No. 349 and alcohol.

Gieson. Numerous pigment phagocytes which contain coarsely granular pigment which stains blue-green to green with Giemsa, orange with Sudan IV, is largely iron free, does not stain with picro aniline blue. There is moderate capsular retraction at the attachment of the trabeculae, and the trabeculae segregate small and large nodules of liver cells which are laden with coarse fat droplets.

Liver shows large, clear, granular liver cells with quite marked irregular deposition of coarse fat droplets in liver cells and midzones of periportal areas. There is moderate periportal and focal interstitial infiltration with macrophages laden with coarsely granular pigment staining green to yellowish green with Giemsa, pale yellowish orange with Sudan IV, and containing but little iron. One lobe shows irregular trabeculation by delicately fibrous connective tissue containing pigment phagocytes and presenting slight capsular retraction.

Liver shows much irregular coarse and medium fat droplet accumulation in liver cells, moderate periportal and focal interstitial accumulation of pigment phagocytes laden with coarsely granular pigment staining blue-green to yellowish green with Giemsa, pale orange with Sudan IV, unstained with Van Gieson, and the cells containing only traces of hemosiderin.

DISCUSSION

Diet No. 349 is low in protein and very low in the sulfur-containing amino-acids. It has previously been demonstrated (*8*) that the addition of 0.5 percent cystine to this diet causes an increase in the rate of growth of albino rats and that increasing the casein to 9 percent permits an increased rate of growth. Whether or not there are other deficiencies is still an open question.

Further experimentation is needed to determine the role of alcohol in the production of hepatic cirrhosis. In these particular experiments, it would appear that alcohol gives an additional insult to liver tissue injured by a dietary deficiency.

CONCLUSIONS

1. Some of the rats on diet No. 349 developed cirrhosis of the liver in the course of a year.
2. The pathologic changes, on the average, seem more severe when approximately 20 percent alcohol is substituted for the drinking water.
3. No statement can be made at the present time as to the nature of the deficiency or deficiencies in this diet which permit or cause the development of hepatic cirrhosis.

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COURT DECISION ON PUBLIC HEALTH

City ordinance prohibiting keeping of animals within restricted area upheld.—(New Mexico Supreme Court; *Mitchell et al.* v. *City of Roswell,* 111 P.2d 41; decided February 18, 1941.) The city of Roswell passed an ordinance which made it unlawful "to keep, cause, or permit to be kept, or to confine one or more horses, mules, burros, cows, goats, sheep, swine or other livestock at any place within the boundaries" of a specified restricted area of the city. This area comprised practically all of the business section and most of the residential section of the city. For 3 years before the passage of the ordinance the plaintiffs had been engaged in the business of importing high-grade bulls and livestock for sale in the city. In the regular course of business and pending their sale the animals were kept, for the purpose of sale only, on premises located within the restricted area. Upon order from the city and under protest the plaintiffs removed their livestock from the said premises when the ordinance went into effect but later brought action under the declaratory judgment act, contending that the ordinance was unreasonable, contrary to the general public policy of the State, and discriminatory. The trial court sustained a demurrer to the complaint and, from a judgment dismissing the case, the plaintiffs appealed. The supreme court said that the question was whether the complaint stated a cause of action.

The appellate court stated that the plaintiffs had to overcome the findings of the city governing board, set forth in the preamble to the ordinance, that the keeping of the animals mentioned within the restricted district was a nuisance and endangered the public health. These findings and the enactment of the ordinance, said the court, established prima facie that the ordinance was reasonable and burdened the plaintiffs with the necessity of disproving it. "We would be reluctant to disagree with Roswell's local authority (primarily the judge of the matter) regarding the reasonableness of its public health regulations, and will not do so unless it is plain and palpable that there is no real or substantial relation between the ordinance and its object." The court said that, in the absence of facts showing otherwise, it would assume that conditions in Roswell were such that the ordinance was not an unreasonable exercise of the police power and said further that there was no discrimination against the plaintiffs and that it was advised of no public policy of the State that would justify its interference.

Another claim by the plaintiffs was that the general welfare statutes, under which the city had necessarily acted in passing the ordinance, had been impliedly repealed, insofar as they had application to the public health, by a comprehensive 1937 law granting certain powers to the State board of public health. But the supreme court said that it did not find any such repeal by implication or any reason for holding that the police powers under consideration could not exist concurrently with the powers granted to the State board of public health.

The judgment of the lower court was affirmed.

DEATHS DURING WEEK ENDED MAY 31, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 31, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,732	7,625
Average for 3 prior years	7,752	
Total deaths, first 22 weeks of year	197,043	198,007
Deaths per 1,000 population, first 22 weeks of year, annual rate	12.6	12.7
Deaths under 1 year of age	463	457
Average for 3 prior years	474	
Deaths under 1 year of age, first 22 weeks of year	11,515	11,095
Data from industrial insurance companies:		
Policies in force	64,478,825	65,415,160
Number of death claims	9,717	9,899
Death claims per 1,000 policies in force, annual rate	7.9	7.9
Death claims per 1,000 policies, first 22 weeks of year, annual rate	10.3	10.4

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JUNE 7, 1941

Summary

The incidence of measles, which has declined each week since April 19, increased during the current week, with a total of 28,588 reported cases as compared with 26,221 for the preceding week. Some of these cases may be delayed reports, but increased incidence was reported currently in all geographic divisions except the South Atlantic and the two South Central areas. The largest increase and the highest case rate were reported in the Middle Atlantic area, where all three States comprising that geographical division reported increases.

Of the 9 communicable diseases included in the following weekly table, only influenza, measles, and whooping cough were above the 5-year (1936–40) median expectancy, while the cumulative totals of these three diseases and of poliomyelitis were above the 5-year cumulative median.

A total of 32 cases of poliomyelitis was reported for the current week as compared with 20 for the preceding week. California reported 5 cases, and New York, Illinois, Florida, and Texas reported 3 cases each, Wisconsin and Oklahoma, 2 cases. No other State reported more than 1 case.

Of a total of 21 cases of Rocky Mountain spotted fever, 8 cases occurred in Wyoming and 6 in Montana. In the South Atlantic area, Delaware and North Carolina reported 1 case each. Of 35 cases of endemic typhus fever, Georgia reported 17 and Florida and Texas 5 each. One case of undulant fever was reported in Connecticut, 1 case of anthrax in Delaware, 1 case of encephalitis in North Dakota, 4 cases of tularemia in Utah, and 3 cases in Mississippi.

The death rate for the current week for 88 major cities in the United States was 11.2 per 1,000 population, as compared with 10.9 for the preceding week. The 3-year (1938–40) average for the corresponding week is also 11.2. The cumulative rate to date is 12.6, the same as for the corresponding period in 1940.

Telegraphic morbidity reports from State health officers for the week ended June 7, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	June 7, 1941	June 8, 1940		June 7, 1941	June 8, 1940		June 7, 1941	June 8, 1940		June 7, 1941	June 8, 1940	
NEW ENG.												
Maine	0	0	0	------	2	------	35	307	147	0	1	0
New Hampshire	0	0	0	------	------	------	10	3	30	0	0	0
Vermont	1	0	0	------	------	------	85	19	96	0	0	0
Massachusetts	0	5	3	------	------	------	1,078	1,341	1,120	3	1	2
Rhode Island	1	1	1	------	------	------	3	255	69	0	0	0
Connecticut	0	0	2	------	1	3	460	35	130	1	0	0
MID. ATL.												
New York	24	17	27	[1] 7	[1] 9	[1] 5	3,185	953	1,856	3	5	5
New Jersey	6	10	13	3	4	4	2,295	1,256	605	1	0	1
Pennsylvania	14	8	25	------	------	------	4,983	455	919	3	6	7
E. NO. CEN.												
Ohio	14	13	13	7	24	7	2,414	29	610	1	2	3
Indiana	4	4	6	------	11	11	537	13	13	1	2	2
Illinois	20	28	28	5	11	18	1,260	188	188	1	0	4
Michigan [2]	1	4	10		2	1	1,434	832	283	1	2	2
Wisconsin	4	3	3	20	16	16	1,865	1,219	686	0	0	0
W. NO. CEN.												
Minnesota	2	1	2	------	2	2	17	88	166	0	0	0
Iowa [3]	1	3	2	------	------	------	24	177	167	0	1	1
Missouri	1	3	9	------	------	3	587	6	21	0	0	0
North Dakota	1	0	0	2	14	11	97	2	7	0	0	0
South Dakota	1	3	1	------	1	------	14	3	3	0	0	0
Nebraska	0	1	2	1	------	------	9	16	19	0	0	0
Kansas	4	2	2	1	2	2	372	357	57	0	0	1
SO. ATL.												
Delaware [3]	0	0	0	------	------	------	69	2	20	0	0	0
Maryland [2]	1	1	4	6	2	2	462	18	195	4	1	1
Dist. of Col.	0	3	5	------	1	------	199	2	93	0	0	0
Virginia	6	6	6	91	47	38	973	336	336	1	1	1
West Virginia [2]	3	6	6	8	6	7	526	26	39	0	2	3
North Carolina [3] [4]	5	9	8	------	1	1	1,182	111	196	0	0	1
South Carolina	3	2	2	80	166	85	332	8	30	0	1	1
Georgia [4]	4	3	4	20	8	------	440	187	21	0	0	0
Florida [4]	6	0	1	14	------	2	198	62	62	0	0	2
E. SO. CEN.												
Kentucky	6	2	6	2	29	8	593	154	144	0	0	4
Tennessee	1	2	6	29	10	16	365	116	94	0	1	1
Alabama [4]	3	8	8	14	9	15	179	52	52	2	0	3
Mississippi [2] [4]	3	6	6	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas	4	5	3	5	15	9	181	45	11	0	0	0
Louisiana [4]	1	3	11	1	14	12	18	5	7	3	1	1
Oklahoma	1	4	4	3	10	18	117	8	33	0	1	1
Texas [4]	16	20	25	419	153	143	562	946	366	3	3	3
MOUNTAIN												
Montana [3]	1	0	1	1	------	------	40	86	86	0	0	0
Idaho [3]	0	2	1	------	------	------	31	16	16	0	0	0
Wyoming [3]	0	2	1	------	1	------	14	8	19	0	0	0
Colorado [3]	8	5	5	18	2	------	282	37	37	0	0	0
New Mexico	0	1	1	1	------	------	212	38	47	0	0	0
Arizona	10	3	2	60	45	24	104	39	39	0	0	0
Utah [3]	0	0	0	5	------	------	30	363	105	0	0	0
Nevada	0	------	------	------	------	------	13	------	------	0	------	------
PACIFIC												
Washington	1	1	2	15	------	------	30	263	263	1	0	0
Oregon [3]	1	10	1	7	3	10	72	236	69	3	0	0
California [4]	16	12	31	[5] 495	110	63	600	491	871	2	0	3
Total	199	222	327	1,339	731	731	28,588	11,209	11,424	34	31	59
23 weeks	6,035	7,254	10,665	592,267	165,405	147,990	750,811	183,643	229,681	1,093	909	1,749

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 7, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	June 7, 1941	June 8, 1940		June 7, 1941	June 8, 1940		June 7, 1941	June 8, 1940		June 7, 1941	June 8, 1940	
NEW ENG.												
Maine	0	0	0	3	2	13	0	0	0	0	1	1
New Hampshire	1	0	0	0	1	1	0	0	0	0	0	0
Vermont	0	0	0	5	3	3	0	0	0	0	0	0
Massachusetts	1	1	1	166	130	164	0	0	0	5	0	1
Rhode Island	0	0	0	9	6	8	0	0	0	0	0	0
Connecticut	1	0	0	35	39	42	0	0	0	1	3	2
MID. ATL.												
New York	3	3	2	411	579	574	0	0	0	7	7	7
New Jersey	0	1	0	173	264	102	0	0	0	2	0	1
Pennsylvania	1	0	1	297	267	267	0	0	0	6	7	7
E. NO. CEN.												
Ohio	0	0	0	220	235	186	1	0	1	6	5	7
Indiana	0	0	0	42	30	62	1	2	7	0	9	6
Illinois	3	2	2	180	590	392	12	4	15	5	3	5
Michigan [2]	0	0	0	125	255	276	5	2	2	1	3	3
Wisconsin	2	0	0	79	91	99	1	11	2	1	0	0
W. NO. CEN.												
Minnesota	0	0	0	40	49	49	0	8	8	3	0	0
Iowa [3]	0	1	0	7	37	56	0	0	15	0	0	0
Missouri	0	0	0	55	18	67	0	6	8	2	2	2
North Dakota	0	0	0	0	4	13	0	0	6	1	1	1
South Dakota	1	0	0	1	16	15	2	5	8	0	0	0
Nebraska	0	0	0	6	13	19	1	1	1	0	1	1
Kansas	0	2	1	27	29	54	0	0	15	1	3	1
SO. ATL.												
Delaware [3]	0	0	0	17	3	3	0	0	0	1	0	0
Maryland [2]	1	0	0	36	30	30	0	0	0	1	1	2
Dist. of Col.	0	0	0	8	21	6	0	0	0	0	0	0
Virginia	0	0	0	19	39	16	0	0	0	7	5	6
West Virginia [2]	0	1	0	20	21	24	0	0	0	6	3	3
North Carolina [3,4]	0	1	1	24	14	16	0	0	0	3	0	5
South Carolina	1	0	0	3	4	3	1	0	0	4	2	6
Georgia [4]	1	0	0	9	5	5	0	0	0	9	6	11
Florida [4]	3	1	1	1	3	3	0	1	0	12	1	4
E. SO. CEN.												
Kentucky	1	0	0	41	37	20	3	0	1	4	9	9
Tennessee	0	3	0	40	32	17	2	2	0	4	0	6
Alabama [4]	1	0	0	12	8	6	1	3	1	2	3	4
Mississippi [3,4]	0	0	2	3	2	2	2	0	0	2	3	5
W. SO. CEN.												
Arkansas	0	0	0	1	2	2	1	2	1	5	9	7
Louisiana [4]	0	1	1	4	10	6	1	0	0	3	6	11
Oklahoma	2	0	0	7	5	5	5	3	3	3	3	9
Texas [4]	3	0	3	16	19	31	0	3	3	11	13	16
MOUNTAIN												
Montana [3]	0	0	0	11	10	11	0	0	3	0	0	0
Idaho [3]	0	0	0	7	0	5	1	0	1	1	0	0
Wyoming [3]	0	0	0	2	2	3	0	0	3	0	2	1
Colorado [3]	1	0	0	21	13	22	0	4	4	0	2	2
New Mexico	0	1	0	0	9	10	0	0	0	2	2	2
Arizona	0	0	0	6	0	4	0	0	0	1	1	2
Utah [3]	0	0	0	6	7	14	0	4	0	1	0	0
Nevada	0			0			0			0		
PACIFIC												
Washington	0	25	0	19	23	25	2	0	1	0	2	2
Oregon [3]	0	0	0	9	11	19	0	0	4	2	2	1
California [4]	5	15	4	103	111	145	0	1	8	3	10	10
Total	32	58	38	2,335	3,099	3,099	42	62	171	128	130	209
23 weeks	543	604	506	81,561	107,264	123,877	1,040	1,607	6,898	1,940	2,088	2,815

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 7, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, week ended— June 7, 1941	Whooping cough, week ended— June 8, 1940
NEW ENG.		
Maine	14	12
New Hampshire	6	38
Vermont	7	47
Massachusetts	286	162
Rhode Island	27	10
Connecticut	58	49
MID. ATL.		
New York	359	279
New Jersey	122	71
Pennsylvania	330	302
E. NO. CEN.		
Ohio	325	145
Indiana	35	50
Illinois	102	91
Michigan [1]	318	197
Wisconsin	125	62
W. NO. CEN.		
Minnesota	87	29
Iowa [3]	33	19
Missouri	53	15
North Dakota	28	15
South Dakota	5	3
Nebraska	11	22
Kansas	157	54
SO. ATL.		
Delaware [3]	0	4
Maryland [3]	108	122
Dist. of Col.	11	5
Virginia	65	59
West Virginia [2]	91	73
North Carolina [3 4]	347	86
South Carolina	92	10
SO. ATL.—continued		
Georgia [4]	27	11
Florida [4]	7	4
E. SO. CEN.		
Kentucky	52	87
Tennessee	51	50
Alabama [4]	55	14
Mississippi [2 4]		
W. SO. CEN.		
Arkansas	60	20
Louisiana [4]	4	5
Oklahoma	24	12
Texas [4]	294	407
MOUNTAIN		
Montana [3]	6	0
Idaho [3]	17	8
Wyoming [3]	12	6
Colorado [3]	185	21
New Mexico	55	45
Arizona	40	29
Utah [2]	62	174
Nevada	15	
PACIFIC		
Washington	123	65
Oregon [3]	24	44
California [4]	894	431
Total	5,209	3,464
23 weeks	106,310	73,248

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended June 7, 1941, 21 cases, as follows: Iowa, 1; Delaware, 1; North Carolina, 1; Montana, 6, Idaho, 2; Wyoming, 8; Colorado, 1; Oregon, 1.
[4] Typhus fever, week ended June 7, 1941, 35 cases, as follows: North Carolina, 1; Georgia, 17; Florida, 5; Alabama, 1; Mississippi, 2; Louisiana, 3; Texas, 5; California, 1.
[5] Mostly delayed reports.

PLAGUE INFECTION IN FLEAS FROM GROUND SQUIRRELS IN KERN COUNTY, CALIF.

Under date of May 29, 1941, Dr. N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved, by animal inoculation and cultures, in a pool of 356 fleas from 32 ground squirrels, *C. beecheyi*, submitted to the laboratory on May 16 from a ranch 12 miles west and 3 miles south of Wheeler Ridge, Kern County, Calif.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 24, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Data for 90 cities:											
5-year average	114	60	28	4,569	449	1,664	17	376	27	1,201	--------
Current week [1]	50	54	15	8,896	283	1,424	0	362	30	1,562	--------
Maine:											
Portland	0	------	0	1	4	3	0	0	0	4	25
New Hampshire:											
Concord	0	------	0	1	0	0	0	0	0	0	4
Manchester	0	------	0	0	0	0	0	1	0	0	17
Nashua	0	------	0	0	0	0	0	0	0	7	5
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	3	0	0	0	0	0	0	11
Rutland	0	------	0	0	0	0	0	0	0	0	6
Massachusetts:											
Boston	1	------	1	247	5	76	0	8	0	58	211
Fall River	1	------	0	2	0	9	0	0	0	4	31
Springfield	0	------	0	71	0	13	0	2	0	22	32
Worcester	0	------	0	22	3	19	0	0	0	12	49
Rhode Island:											
Pawtucket	0	------	0	0	1	1	0	0	0	0	13
Providence	0	------	0	2	1	3	0	0	0	20	62
Connecticut:											
Bridgeport	0	------	0	18	3	1	0	0	0	1	27
Hartford	0	------	0	5	6	1	0	0	0	3	27
New Haven	0	------	0	3	1	19	0	0	0	0	35
New York:											
Buffalo	0	------	0	77	6	48	0	3	0	8	109
New York	15	3	0	1,508	46	297	0	72	7	90	1,429
Rochester	0	------	0	285	4	4	0	3	4	21	77
Syracuse	0	------	0	1	1	3	0	2	0	16	64
New Jersey:											
Camden	2	------	0	7	0	14	0	2	0	3	34
Newark	0	1	0	67	1	34	0	7	0	17	94
Trenton	0	------	0	69	0	24	0	2	0	0	24
Pennsylvania:											
Philadelphia	3	4	3	441	12	161	0	25	0	100	474
Pittsburgh	2	------	0	1,189	4	23	0	6	0	40	135
Reading	1	------	0	76	2	5	0	2	0	2	31
Scranton	0	------	--------	88	-------	0	0	-------	0	1	--------
Ohio:											
Cincinnati	0	------	0	54	1	13	0	7	1	4	137
Cleveland	1	5	1	54	5	68	0	12	0	59	189
Columbus	0	1	1	153	3	19	0	2	0	21	82
Toledo	0	------	0	422	1	2	0	7	1	31	65
Indiana:											
Anderson	0	------	0	16	1	0	0	1	0	0	11
Fort Wayne	0	------	0	14	1	0	0	0	0	2	32
Indianapolis	3	------	0	805	8	14	0	3	0	12	111
Muncie	0	------	0	32	2	7	0	0	0	0	11
South Bend	0	------	0	13	3	0	0	1	0	3	14
Terre Haute	0	------	1	3	3	0	0	1	2	0	21
Illinois:											
Chicago	5	1	0	235	25	129	0	46	2	48	683
Elgin	0	------	0	4	0	0	0	0	0	1	12
Moline	0	------	0	6	0	1	0	0	0	0	8
Springfield	0	1	1	37	1	5	0	0	0	0	15
Michigan:											
Detroit	2	4	0	549	10	148	0	13	0	118	262
Flint	0	------	0	50	5	3	0	0	0	18	25
Grand Rapids	0	------	0	186	0	8	0	0	0	9	40
Wisconsin:											
Kenosha	0	------	0	102	0	4	0	0	0	0	4
Madison	0	------	0	22	0	4	0	0	0	2	8
Milwaukee	0	------	0	547	3	24	0	9	0	46	104
Racine	0	------	0	33	0	2	0	0	0	5	15
Superior	0	------	0	1	0	2	0	1	0	7	11
Minnesota:											
Duluth	0	------	0	0	1	0	0	0	0	23	21
Minneapolis	1	------	0	8	3	15	0	2	1	18	97
St. Paul	0	1	1	1	4	8	0	4	0	33	63

[1] Figures for Barre estimated; report not received.

City reports for week ended May 24, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	------	------	5	------	0	0	------	0	0	------
Davenport	0	------	------	6	------	1	0	------	0	0	------
Des Moines	0	------	------	8	------	3	0	------	0	2	46
Sioux City	0	------	------	1	------	0	0	------	0	10	------
Waterloo	0	------	------	32	------	0	0	------	0	0	------
Missouri:											
Kansas City	0	------	0	119	4	4	0	3	1	19	99
St. Joseph	0	------	0	17	2	1	0	0	0	1	21
St. Louis	1	------	0	267	8	68	0	3	0	47	209
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	14	5
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	------	11	------	0	0	------	0	2	4
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	0	------
Sioux Falls	0	------	------	0	------	4	0	------	0	0	10
Nebraska:											
Lincoln	1	------	------	1	------	5	0	------	0	1	------
Omaha	0	------	0	16	4	3	0	1	0	1	53
Kansas:											
Lawrence	0	------	0	4	0	0	0	0	0	2	3
Topeka	0	------	0	74	1	0	0	0	0	23	23
Wichita	0	------	0	6	0	1	0	1	0	17	23
Delaware:											
Wilmington	0	------	0	10	1	9	0	0	0	0	27
Maryland:											
Baltimore	0	1	0	218	13	16	0	10	2	85	235
Cumberland	0	------	0	14	1	0	0	0	0	8	11
Frederick	0	------	0	1	1	0	0	0	0	1	4
Dist. of Col.:											
Washington	0	1	1	218	10	14	0	11	0	10	150
Virginia:											
Lynchburg	0	------	0	15	1	1	0	0	0	4	12
Norfolk	1	1	0	113	1	0	0	0	1	1	21
Richmond	0	------	0	57	1	1	0	3	0	0	56
Roanoke	0	------	0	11	0	0	0	0	0	2	17
West Virginia:											
Charleston	0	------	0	3	1	0	0	1	0	0	18
Huntington	0	------	------	49	------	2	0	------	0	4	------
Wheeling	0	------	0	57	0	1	0	1	0	4	18
North Carolina:											
Gastonia	0	------	------	18	------	0	0	------	0	0	------
Raleigh	0	------	0	8	1	0	0	0	0	85	17
Wilmington	0	------	0	15	0	0	0	0	0	18	9
Winston-Salem	0	------	0	7	2	2	0	1	1	0	18
South Carolina:											
Charleston	0	1	0	4	2	0	0	1	0	1	19
Florence	0	------	0	0	0	0	0	0	0	0	11
Greenville	1	------	0	8	2	0	0	1	0	4	10
Georgia:											
Atlanta	0	------	0	31	4	0	0	7	0	0	91
Brunswick	0	------	0	7	0	0	0	0	0	2	5
Savannah	0	3	0	6	0	11	0	3	0	0	39
Florida:											
Miami	0	1	0	2	1	0	0	1	0	9	34
St. Petersburg	0	------	0	81	1	0	0	1	0	0	20
Tampa	1	------	0	0	1	0	0	0	0	2	26
Kentucky:											
Ashland	1	------	0	4	0	2	0	0	0	0	6
Covington	0	------	0	0	1	3	0	1	0	0	15
Lexington	0	------	0	2	0	0	0	2	0	4	12
Louisville	0	------	0	631	3	31	0	4	0	8	62
Tennessee:											
Knoxville	0	------	0	12	2	5	0	2	0	1	27
Memphis	1	------	0	121	2	3	0	10	2	28	89
Nashville	0	------	0	40	5	0	0	5	1	8	42
Alabama:											
Birmingham	0	------	1	28	6	7	0	2	0	1	74
Mobile	0	2	0	2	1	0	0	0	0	0	25
Montgomery	0	1	------	19	------	0	0	------	0	2	------
Arkansas:											
Fort Smith	0	------	------	1	------	0	0	------	0	4	------
Little Rock	0	------	0	7	6	0	0	2	0	7	35

City reports for week ended May 24, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	1	5
New Orleans	0	1	1	6	4	2	0	9	0	0	134
Shreveport	0	------	0	2	2	1	0	5	2	0	34
Oklahoma:											
Oklahoma City	1	3	0	8	4	2	0	0	0	0	35
Tulsa	0	------	0	71	1	1	0	0	0	11	10
Texas:											
Dallas	2	1	1	43	0	2	0	3	1	4	65
Fort Worth	0	------	0	9	1	0	0	2	1	3	35
Galveston	0	------	0	0	1	3	0	1	0	0	17
Houston	2	------	0	1	2	4	0	3	2	2	64
San Antonio	0	3	0	3	6	0	0	3	1	3	53
Montana:											
Billings	0	------	0	0	1	0	0	0	0	0	6
Great Falls	0	------	0	3	1	0	0	1	0	1	15
Helena	0	------	0	3	0	0	0	0	0	0	2
Missoula	0	------	0	0	0	0	0	0	0	1	6
Idaho.											
Boise	0	------	0	0	0	0	0	0	0	1	9
Colorado:											
Denver	3	4	1	412	1	4	0	2	0	125	84
Pueblo	0	------	0	7	0	0	0	0	0	26	9
New Mexico:											
Albuquerque	0	------	0	23	0	0	0	1	0	0	10
Arizona:											
Phoenix	0	27	------	0	------	0	0	------	0	6	------
Utah:											
Salt Lake City	3	------	0	9	0	7	0	0	0	5	40
Washington:											
Seattle	0	------	0	0	1	7	0	6	0	32	110
Spokane	0	------	0	9	0	1	0	0	0	1	28
Tacoma	0	------	0	2	1	2	0	0	0	11	32
Oregon:											
Portland	2	------	1	2	2	1	0	3	0	3	82
Salem	0	------	------	0	------	1	0	------	0	0	------
California:											
Los Angeles	0	9	1	61	3	25	0	11	0	58	313
Sacramento	0	1	0	5	2	2	0	2	0	17	37
San Francisco	0	6	0	14	5	8	0	15	0	89	164

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				South Carolina:			
Fall River	1	0	0	Charleston	1	0	0
Connecticut:				Florida:			
New Haven	1	0	0	Miami	0	0	4
New York:				Alabama:			
Buffalo	2	1	0	Mobile	0	0	1
New York	5	2	0	Louisiana:			
Illinois:				New Orleans	2	1	0
Chicago	3	0	0	California:			
Michigan:				Los Angeles	1	0	0
Detroit	1	0	0				
Maryland:							
Baltimore	2	1	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Norfolk, 1.
Pellagra.—Cases: Charleston, S. C., 2; Atlanta, 1; Savannah, 2; Birmingham, 1.
Typhus fever.—Cases: New York, 1; Charleston, S. C., 2; Los Angeles, 1. Deaths: Houston, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—Rats proved positive for plague infection have been reported from the vicinity of Kalopa Camp, Hamakua District, Island of Hawaii, T. H., as follows: 2 rats, May 2; 1 rat, May 5; 3 rats, May 6; 1 rat, May 7; 1 rat, May 9; and 1 rat, May 15.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 10, 1941.—During the week ended May 10, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	4	8		10	11	1	1		5	40
Chickenpox		18		101	120	43	36	25	41	384
Diphtheria		24	1	15	3	2	16	1	1	63
Dysentery				2	1					3
Influenza		32			4				9	45
Lethargic encephalitis				1		1				2
Measles		60	17	408	1,418	69	126	74	350	2,522
Mumps				210	245	24	21	17	25	542
Pneumonia	1	8			9		1		5	24
Poliomyelitis						1				1
Scarlet fever		26	5	102	176	3	8	10	15	345
Smallpox							9			9
Trachoma									3	3
Tuberculosis	5	7	5	73	43	2	27			162
Typhoid and paratyphoid fever				17	1			3		21
Whooping cough				53	212	1	10	6	53	335

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Public Health Reports

VOLUME 56 JUNE 20, 1941 NUMBER 25

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

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Public Health Reports

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RADIO PRATIQUE AT THE PORT OF NEW YORK

Radio pratique was introduced at the port of New York on February 1, 1937, by Dr. Charles V. Akin of the Public Health Service, who was then Chief Quarantine Officer of that port. Its purpose is to facilitate the handling of vessels ordinarily subject to quarantine inspection.

Under this procedure certain carefully selected passenger vessels with a satisfactory health and sanitary status may enter specified United States ports and proceed directly to dock without stopping for the customary quarantine inspection, provided the ship's doctor certifies to the quarantine station through the ship's agents, by radio before arrival, that health conditions on board are satisfactory.

To be eligible for radio pratique a vessel must fulfill certain conditions, fully outlined in the following explanation. It must be a passenger vessel employing a full-time doctor on board, must be in a satisfactory sanitary and relatively rat-free condition, must carry no commercial shipments of psittacine birds, and must be in service between certain specified ports which are not infected with quarantinable disease. Health conditions on board during the voyage must have been satisfactory.

Radio pratique is at present in use in several United States ports. The following explanation of the administrative procedures in connection with radio pratique at the port of New York has been prepared by Dr. Robert Olesen, at present Chief Quarantine Officer of the port.

General Information

Applications for the establishment or restoration of eligibility for radio pratique and all questions concerning eligibility under any particular circumstances shall be addressed to the Chief Quarantine Officer in writing. Interpretations, rulings, and opinions will likewise be given only in writing.

Provided all conditions have been met, eligible vessels may proceed directly to their docks without anchoring and undergoing quarantine inspection. After radio pratique or other quarantine formalities have been completed, vessels may remain for brief periods in the quarantine anchorage until ready to proceed to their docks.

Facilities for quarantine inspection are maintained constantly at the United States Quarantine Station, Rosebank, Staten Island, N. Y.

A passenger vessel designated as eligible for radio pratique will not lose its eligibility while engaged in cruises outside its regular itinerary, provided such cruises include acceptable ports and that advance notice is filed of the intention to engage in a specified cruise.

Following the loss of eligibility because of failure or inability to comply with radio pratique requirements, the agents of a vessel may apply for restoration of the privilege. The Chief Quarantine Officer may restore radio pratique when full compliance with the requirements is again assured and observed.

There are no charges incident to the operation of radio pratique. However, charges for rat infestation inspection, sanitary inspection, fumigation, and other required quarantine treatment will be made in accordance with the official schedule.

The following definitions, rules, and conditions govern the eligibility of vessels, the method of applying for radio pratique, and the procedure whereby this privilege is granted to vessels primarily engaged in carrying passengers from foreign ports to the port of New York.

Agents seeking radio pratique for a vessel must submit an application in accordance with the following form:

(Date)

The Chief Quarantine Officer,
Rosebank, Staten Island, N. Y.

Sir: It is requested that the -- be
(Nationality and name of vessel)
considered for radio pratique. The vessel is continually maintained in a clean and sanitary condition and is believed to be rat-free.

The following data are submitted:

1. The vessel operates on a regular schedule with a fixed itinerary, and is licensed as a passenger-carrying vessel by the Bureau of Marine Inspection and Navigation of the United States Department of Commerce.
2. The total cargo-carrying capacity of this vessel is -------- tons.
3. The foreign ports regularly visited are ----------------------------------
4. The vessel reaches New York at intervals of ----------------------
5. The vessel carries as a regular member of the crew a doctor who is a full-time employee.
6. Name of the ship's doctor --

It is understood by the undersigned steamship agents that should this application be approved, the vessel may enter the port of New York without stopping for quarantine inspection. Prior to each entry of the vessel, application will be made by radio to the Chief Quarantine Officer through the undersigned agents. The application for radio pratique will include all information required by the rules and regulations governing this privilege.

-- Company.
By --
-- (title).

Definitions

1. *Communicable diseases.*—These are of particular interest to civil health authorities and must be reported to the Chief Quarantine

Officer at the time of requesting radio pratique and also directly to the department of health having jurisdiction, as prescribed by the Sanitary Code. The communicable diseases include the following:

Chickenpox.
Diphtheria.
Dysentery (amebic or bacillary).
Encephalitis.
Gastrointestinal disease.
German measles.
Measles.
Meningitis.
Mumps.
Paratyphoid fever.
Poliomyelitis (infantile paralysis).
Scarlet fever.
Tuberculosis.
Typhoid fever.
Whooping cough.

Reporting to departments of health: Insofar as New York City is concerned the duty of ship's officers on incoming vessels to report and detain on board persons having communicable disease is set forth in article 18 of the Sanitary Code. Reporting is also required to the city department of health of births, deaths, and marriages at sea of residents of the city of New York, in addition to the reporting of all cases of communicable disease. When vessels dock at ports in the metropolitan area other than New York, viz, Jersey City, Hoboken, etc., reports of communicable disease, births, deaths, and marriages must be submitted promptly to the department of health having jurisdiction.

When communicable disease develops between the time radio pratique is granted and the docking of the vessel within the city limits, the appropriate city department of health must be notified immediately by the ship's officers or agents. In the meantime the sick must be isolated pending removal or other disposition by representatives of the department of health.

The Chief Quarantine Officer will, upon request, assist the officers and agents of vessels in establishing official contact with the department of health in order that acceptable procedures may be instituted.

2. *Quarantinable diseases.*—Because of their more serious import, special laws and regulations govern the so-called "quarantinable" diseases. Precautions must be taken to prevent the embarkation and transportation to United States ports of persons having such diseases. However, when a vessel arrives with quarantinable disease aboard, it must stop in the quarantine anchorage and await the treatment prescribed by the quarantine laws and regulations. Immediate notification to the Chief Quarantine Officer of the presence on a vessel of these diseases is among the foremost requirements. The quarantinable diseases have been officially designated as follows:

Anthrax.
Cholera.
Leprosy.
Plague.
Psittacosis (parrot fever).
Smallpox.
Typhus fever.
Yellow fever.

3. *Doctors (ships')*.—A fully qualified and regularly employed physician devoting whole time to his duties, acceptable to the steamship company and the Public Health Service by reason of skill, experience, reputation, and registered credentials. A photostatic copy of the license to practice medicine, issued by a State board of medical examiners, will be accepted as prima facie evidence of a doctor's professional qualifications. When a ship's doctor is not a citizen of the United States, a photostatic copy of the certification of his professional qualifications from the country of which he is a citizen will receive due consideration.

With his credentials an applicant for registry as doctor on radio pratique vessels shall submit a recent, unmounted photograph of himself.

Special considerations: (*a*) A ship's doctor may serve on vessels other than the one to which he originally was appointed, but notice of such transfer must be sent promptly to the Chief Quarantine Officer.

(*b*) The agents of a vessel anticipating radio pratique shall communicate to the Chief Quarantine Officer the name of the eligible ship's doctor, preferably prior to the vessel's arrival in New York.

(*c*) When a steamship company requiring the services of a ship's doctor makes a definite tender of employment to a qualified physician, the Public Health Service requires for its consideration photostatic copies of documents attesting the professional qualifications of the physician. The list of eligible ships' doctors is not established by the Public Health Service but by the steamship company having definite need of medical service. However, the Public Health Service maintains registries of ships' doctors who are on the active or inactive lists and are eligible for service on radio pratique vessels.

The Public Health Service encourages the shipping interests, and physicians, too, to regard the position of ship's doctor as a full-time and permanent career worthy of the best traditions of medicine. Radio pratique will achieve its fullest measure of success when the ship's doctor is fully conversant with and alert to his responsibility in safeguarding the public health.

4. *Psittacine birds* (including African grays, Amazons, cockatoos, lories, lorikeets, love birds, macaws, Mexican double heads, parakeets, parrots, and all similar birds).

(*a*) *A commercial shipment* consists of one or more birds imported for the purpose of sale. A vessel with such a shipment loses for the time being its radio pratique privileges and must stop for quarantine inspection. The presence of such a commercial shipment of psitta-

cine birds will necessitate the application of special measures, as follows:

(1) Birds of the parrot family of an age greater than 8 months may be permitted entry at certain United States ports designated by the Surgeon General of the Public Health Service. (The port of New York is not one of these.) The conditions under which such commercial shipments may enter have been specified in Foreign Quarantine Division Circular No. 67, of the Public Health Service, issued May 11, 1939, and in greater detail in title 42, chapter 1, of the regulations dated April 28, 1939, and issued by the United States Treasury Department. Copies of these regulations may be obtained upon application to the Chief Quarantine Officer.

(2) Commercial shipments arriving in New York or other ports lacking facilities for the quarantine of psittacine birds will not be permitted to land.

(*b*) *Privately owned birds* not to exceed three in number may be admitted provided they have been in the owner's possession at least 2 years immediately prior to entry, are healthy, have not been in contact with other birds of the parrot family, and will not be offered for sale, barter, be given away, or placed on public exhibition. In addition to an inspection by a Public Health Service representative, a permit will be required from the department of health of the city of New York for transfer through and away from the city and State of New York which are prohibited territory.

The presence of privately owned birds is not sufficient grounds for withholding radio pratique, but it should be known that the Public Health Service discourages the importation of all psittacine birds because of the possibility of introducing psittacosis, a disease of high infectivity and heavy mortality.

(*c*) The presence of psittacine birds must be made known simultaneously with the request for radio pratique. Subsequent action will depend upon the circumstances. However, all birds must be held either on the vessel or at the dock until inspected by a representative of the Public Health Service.

5. *Rat-attractive cargo.*—Includes all foodstuffs, raw or refined, intended for human or animal consumption, exclusive of ship's stores, when stowed in bulk or packed in containers of nonratproof materials.

6. *Rat-harboring cargo.*—Includes all cargo packed, crated, boxed, bagged, or baled in such a manner that the individual package, crate, box, bag, or bale may be entered by a rat, either through normal

openings in the container or through holes cut by rats and which afford safe harborage to the rat after gaining entry.

7. *Vessels.*—(*a*) *Cargo vessels.*—For the purpose of radio pratique this is one not within the description of a "passenger" vessel as defined below. A vessel regularly carrying an appreciable amount of rat-attractive or rat-harboring cargo, irrespective of the number of passengers accommodated, is ineligible for radio pratique.

(*b*) *Passenger vessels:* One operating on a regular schedule with a fixed itinerary, having for its principal purpose the carrying of passengers, and licensed as a passenger-carrying vessel by the Bureau of Marine Inspection and Navigation of the United States Department of Commerce.

Eligibility

A passenger vessel will be considered for radio pratique, provided:

(1) A qualified and approved, full-time ship's doctor is employed. (The name of an eligible ship's doctor should be communicated to the Chief Quarantine Officer before the vessel leaves port on its outward voyage.)

(2) It has not, on the proximal voyage, touched at a foreign port against which special measures have been invoked because of quarantinable disease being present or suspected of being present.

(3) It carries no commercial shipments of psittacine birds (parrots, etc.).

(4) It is maintained in a relatively rat-free condition.

(5) It is maintained in sanitary condition and there is satisfactory cooperation from the ship's personnel.

(6) There has been no known or suspected quarantinable disease during the voyage, and no unusual incidence of any other communicable disease.

Vessels eligible for radio pratique.—Passenger vessels in regular service between:

(*a*) New York and certain European ports.

(*b*) The east and west coasts of the United States via the Panama Canal.

(*c*) New York and the Panama Canal.

(*d*) New York and Bermuda, or ports in the West Indies. Also passenger vessels engaged in seasonal cruises to Bermuda or ports in the West Indies.

The designation "West Indies" shall include ports in the following Island groups:

(1) Greater Antilles—including Cuba, Jamaica, Puerto Rico, and Haiti.

(2) Lesser Antilles—including Windward Islands, Leeward Islands, and numerous smaller islands.

(3) The Bahamas.

(*e*) New York and certain ports of Central and South America.

Vessels ineligible for radio pratique.—(*a*) Cargo vessels.

(*b*) Passenger vessels having either known or suspected quarantinable disease or an unusual incidence of any other communicable disease.

(*c*) Vessels from ports against which special measures have been invoked because quarantinable disease is present or is suspected of being present.

(*d*) Passenger vessels with commercial shipments of birds of the parrot family.

(*e*) Passenger vessels which do not carry a qualified and full-time doctor.

(*f*) Vessels not approved by the Public Health Service because of sanitary defects.

Radio Pratique Procedure

Not more than 24 hours nor less than 12 hours before the expected arrival of an eligible vessel at New York, a message shall be addressed by the ship's officers to the Chief Quarantine Officer through the agents. This message shall contain the information required for determining whether the vessel may proceed to its dock without stopping for quarantine inspection.

It will not be necessary, in the preliminary request for radio pratique, to give the number of passengers and crew. (This information is required in the final written confirmation. See p. 1277.) Insofar as the Public Health Service is concerned the message may be transmitted in code, provided the following essential information is included:

(1) Known or suspected quarantinable disease.

(2) Incidence of any other communicable disease.

(3) Commercial shipments of psittacine birds.

Applications for radio pratique will be received by telephone and acted upon only between the hours of 9 a. m. and 4 p. m. daily, including Sundays and holidays. These telephone messages will be addressed to the Officer of the Day, Quarantine Station, Telephone Gibraltar 7-1400.

It will no longer be necessary to confirm this request in writing.

If the application is approved the master of the vessel will be notified by radio, through its agents, the provisions, if any, being indicated at the time the message is sent.

The Government will be subject to no expense in connection with messages used in establishing radio pratique.

At 4 p. m. daily the quarantine station will communicate with the Customs, Immigration, and Post Office officials, giving the names of vessels to which radio pratique has been granted and which are scheduled to arrive on the following day. At the same time the approximate hour at which it is expected the vessel will pass the quarantine station will be given.

When a vessel eligible for radio pratique but unable, because of unusual circumstances, to comply with the usual requirements, is passed without boarding by the quarantine officer, an immediate report of the granting of modified radio pratique will be made by telephone to the above mentioned Federal agencies.

As soon as radio pratique is granted, formal notification in writing on Federal Security Agency Form No. 1940–A will be sent by the Chief Quarantine Officer to the Collector of Customs.

FINAL WRITTEN CONFIRMATION (VERY IMPORTANT!)

As soon as a vessel reaches its dock a final confirmatory statement shall be prepared by the ship's officers in conformity with the accompanying sample. This statement must be completed in its entirety and dispatched immediately by special delivery to the Chief Quarantine Officer.

The confirmation form, not being available from the Public Health Service, must be printed, typed, or otherwise duplicated by each steamship company.

Loss of radio pratique privileges through disuse.—When radio pratique has not been used for a period of 6 months, the vessel will automatically be removed from the eligible list. Before eligibility is restored a new application will be required, observing all of the formalities originally stipulated for placing the vessel on the radio pratique list. These requirements will include an acceptable ship's doctor, freedom of the vessel from rat infestation, and satisfactory sanitation.

Lapsed radio pratique will not be restored until after the first re-entry of such a vessel and after an inspection has disclosed the existence of conditions satisfactory to the Public Health Service.

Final Confirmation on Radio Pratique

(By special delivery mail)

The CHIEF QUARANTINE OFFICER,
United States Quarantine Station, Rosebank, Staten Island, N. Y.

SIR: The..................S/S..
(Nationality) (Name)

arrived in New York on...with the following:

Officers and crew...
First- or cabin-class passengers..............................
Second- or tourist-class passengers...........................
Third-class passengers..
Stowaways...
Workaways...

There was no known or suspected quarantinable disease during the voyage.

The names, home addresses, and ailments of all persons, passengers and crew, ill during the voyage from a communicable disease, including diarrhea, dysentery, typhoid fever, or any other gastrointestinal ailment, are listed on a separate sheet accompanying this statement.

If no such illnesses, so state..................

Place and date of last fumigation certificate or last fumigation exemption certificate..
(Place and date)

Psittacine birds (parrots, etc.)..

Ports touched during voyage...

Bills of health from ports of call accompany this statement

CERTIFIED CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF

....
(Ship's doctor) (Ship's master)

THE GROWTH AND EFFECTS OF THE TUBERCLE BACILLUS ON THE CHORIO-ALLANTOIC MEMBRANE OF THE CHICK EMBRYO: A METHOD FOR STUDIES IN CHEMOTHERAPY[1]

By E. W. EMMART, *Associate Cytologist*, and M. I. SMITH, *Chief Pharmacologist*, *United States Public Health Service*

The length of time required for tubercle formation in experimental animals inoculated with tubercle bacilli has raised the question as to whether or not this period could be shortened by the cultivation of the bacillus on the chorio-allantoic membrane of the chick embryo. Goodpasture and Anderson in 1937 (*1*) and Costil and Bloch in 1938 (*2*) successfully obtained tubercles in the chorio-allantoic membrane from implants of suspensions of *Mycobacterium tuberculosis avium* as early as 7 days after inoculations. It remains to be shown whether

[1] From the Division of Chemotherapy, National Institute of Health.

tubercles so produced can be consistently differentiated from cellular lesions producible by injections of dead tubercle bacilli. If this could be shown, then the production of tubercles in the membrane, the time required for their appearance, and the incidence of their occurrence might be correlated with the virulence of the strain of the bacillus. Such a technique might thus be used to compare the pathogenicity of different strains of tubercle bacilli. In addition the method might be useful for testing the tuberculocidal action of drugs or their ability to attenuate the bacillus.

The present paper deals with observations on the principal morphological changes which occur in the chorio-allantoic membrane of the chick embryo after implantations of several strains of tubercle bacilli on the outer surface of the membrane.

MATERIAL AND METHODS

Four strains of tubercle bacilli were used in this work.

1. Human H 37 (Saranac).[2] This strain after cultivation in this laboratory on Jensen's egg medium was found to be one of low virulence. When injected intraperitoneally into guinea pigs, 1 mg. failed to produce generalized tuberculosis or any evidence of tuberculous infection beyond a few miliary tubercles in the spleen or liver in some of the animals. In a personal communication Dr. Gardner wrote in reference to it as follows: "This strain will maintain a standard degree of infectivity when grown on Proskauer and Beck's synthetic medium. If we attempt to carry it on a solid medium, it immediately reverts" (to the avirulent form).

2. Human H 37 (Phipps).[3] This strain has been carried at the Phipps Institute for several years on either Long's synthetic medium or Dorset's egg medium and has been passed through animals several times to maintain its virulence. It was transferred to Jensen's egg medium after being received in our laboratory. We have no data on its pathogenicity in guinea pigs.

3. Human A 27 (Phipps).[3] This strain was isolated at the Phipps Institute from a patient in 1938; and after a preliminary cultivation period on 3 percent glycerol agar slants it was maintained regularly on Dorset's medium before being received by us, after which it was transferred to Jensen's egg medium. In our laboratory 0.5 mg. injected intraperitoneally produced generalized and usually fatal tuberculosis in guinea pigs in 40 to 60 days.

4. Bovine Ravenel (smooth) (Phipps).[3] In our laboratory when this strain was injected intravenously into rabbits in doses of 0.015

[2] Received through the courtesy of Dr. Leroy U. Gardner, Saranac Laboratory for the Study of Tuberculosis.

[3] Obtained through the courtesy of Dr. Florence B. Seibert of the Henry Phipps Institute.

mg., extensive tuberculosis was produced, terminating in death in 30 to 50 days. This highly virulent strain was maintained on modified Lowenstein's bone marrow infusion medium until received in our laboratories, at which time it was transferred to Jensen's egg medium.

For comparison, heat-killed bacilli, normal saline solution, and a saline solution of tuberculin were also placed on the surface of the chorio-allantoic membrane. The heat-killed bacilli used in this work were obtained by autoclaving H 37 cultures of the Saranac strain, which had been grown on Jensen's egg medium. The tuberculin used in these experiments was a sample of the highly purified protein (PPD) for which we are indebted to Dr. Seibert. This was dissolved in normal saline to make a 1-percent solution and used in amounts of 1.0 and 2.0 mg. Experiments with normal saline solution were used as controls.

Suspensions of bacilli of known concentrations were obtained by weighing the bacilli aseptically in sterile watch glasses and diluting this known quantity with the desired volume of sterile normal salt solution. A finely dispersed suspension of bacilli was obtained by rotating the suspension for half an hour in sterile pyrex flasks with agate balls in a White bacteria grinder.

Sterile 1 cc. tuberculin syringes were used to measure out a given volume to each egg, 0.2 cc. being commonly used.

After several futile attempts to use young embryos, eggs of 9 days' incubation were selected as the most suitable for inoculation, since the survival rate was much better when the older embryos were used. The eggs were carefully washed with alcohol and placed in an egg support (fig. 1), especially designed so that the egg could be held rigidly on its side and turned on a revolving turntable when the shell was cut.

The technique employed was essentially as described by Goodpasture and Anderson (*1*). The upper side of the egg was washed with 95 percent alcohol with a sterile swab and painted on the upper side with melted paraffin. Small strips of "parafilm" about 7 mm. wide were then folded to make a square about 15 mm. on a side. Several thicknesses of this ribbon formed a ridge to support the cover slip. This area was again painted with hot sterile paraffin and a square opening about 13 mm. on a side was cut with a rotating carborundum disk. The shell was then carefully lifted off and the shell membranes removed with forceps without tearing the fetal membranes. The suspension of tubercle bacilli was then implanted on the surface of the membrane and a sterile cover glass sealed over the top with sterile paraffin.

Daily observations were made on the condition of the embryo and the membranes. After 6 or 7 days the cover glass was removed and several cc. of neutral 3 percent formaldehyde were added to all

surviving embryos. This method of fixing and hardening the membrane *in situ* prevented shrinkage. After 15 minutes Zenker-formol solution was added and the tissue fixed for 5 minutes. The exposed membranes were then cut away with small curved scissors and the tissue left in Zenker's solution overnight. The membranes were then washed, dehydrated initially in 50 percent alcohol, passed through Lugol's solution, decolorized, further dehydrated, cleared in xylol, embedded in "histowax A," sectioned and routinely stained by the Ziehl-Neelson and methylene blue method and duplicates with hematoxylin and eosin.

In the more recent preparations "cellosolve" was substituted for the more concentrated alcohol in the dehydration process. This gave better results, prevented hardening, and reduced the time required by the older methods of dehydration with a graded series of alcohols.

MORPHOLOGICAL STRUCTURE OF THE CHORIO-ALLANTOIC MEMBRANE AND SOME CHANGES NOTED

The chorio-allantoic membrane of 9 days' incubation period covers the embryo and extends approximately three-quarters of the way around the yolk mass as far as the albumen. The membrane consists of an outermost epithelial layer derived from the ectodermal layer of the chorion. This layer lies in close contact with the shell membrane and consists of two layers of cells except where it is penetrated by the capillaries. Here it is a single cell layer thick so that the leucocytes of the circulating blood readily come in contact with the cell membranes on the surface.

Lying directly beneath the outer epithelial layer is the mesodermal layer composed largely of connective tissue through which the blood vessels extend. The tissue of this layer is composed of a loose network of mesoblastic cells, polygonal and spindle-shaped, embedded in a homogeneous clear ground substance. The proliferation and differentiation of cells of this layer give rise to the tubercle.

The under surface of the mesodermal tissue is lined with a layer of interlocking epithelial cells derived from the entoderm. These are arranged in a flat pavement of cells which forms the innermost layer of the chorio-allantoic membrane. The morphological difference between this layer of flattened single cells and the thicker cell layer of the outer surface facilitates the orientation of the membrane in sections. Thus far we have no experimental data to indicate that this inner epithelial layer is affected by implantation of bacilli on the outer surface or by the development of tubercles in the mesodermal layer.

The evidence from our experiments has indicated that proliferation of the cells of the chorio-allantoic membrane can be produced experimentally by both mechanical as well as chemical injury. The removal of the shell membrane alone tended to stimulate the proliferation of the surface cells. Frequently, when the shell membrane was removed the capillaries lying near the surface were injured, resulting in small hemorrhagic areas. Beneath these areas of cellular exudate the epithelial cells proliferated, but these thickenings caused by mechanical injury appeared different from the more extensive cellular proliferation caused by chemical injury.

In experiments in which normal saline was placed on the chorio-allantoic membrane, the membrane showed no marked change other than a minor thickening such as was produced by slight mechanical injury.

Chemical injury from tuberculin and the implantation of live or dead tubercle bacilli on the chorio-allantoic membrane produced proliferation of the cells of the outer ectodermal epithelial layer, or in the cells of the mesodermal layer or both. It should be especially emphasized that embryos from eggs of hens of the same breed may differ widely in their response to a given amount of any particular strain of bacilli. Also, there were no specific morphological changes in the membranes which could be associated with any one strain to the exclusion of the others.

Proliferation of the ectodermal epithelium sometimes resulted in a form of hyperplastic nodular thickening protruding from the surface of the membrane as indicated in some of the experiments with live bacilli of the Ravenel strain. The proliferating cells of the outer epithelial layer commonly, however, produced only a general thickening along the surface, becoming squamafied and gradually sloughing off. Invaginations of the epithelium also occurred at times and epithelial "pearls" in some preparations appeared to have become detached from the outer epithelial layer and imbedded in the mesodermal layer.

Proliferation of the mesoblastic cells deep in the membrane had no direct association with the areas of surface proliferation since multiplication of the mesoblastic cells occurred beneath normal as well as injured ectoderm. Cellular proliferation and differentiation in the mesodermal tissue gave rise to foci of dense clusters of monocytes. This was accompanied by increased infiltration of polymorphonuclear leucocytes. Eosinophils were common among these cells. With the evolution of the tubercle the monocytes increased in number and large phagocytes with engulfed bacilli often made their appearance.

IMPLANTATIONS OF LIVE TUBERCLE BACILLI

A. H 37 (Saranac). The first strain of bacilli implanted on the chorio-allantoic membrane was the avirulent H 37 strain obtained from the Saranac Laboratories. Of 58 embryos so treated 29 survived and of these only 4 showed gross tubercles, while 17 showed slight thickenings and opacities. Of the 29 surviving embryos, 14 received 0.25 mg. of tubercle bacilli; the rest received 1 mg. The former were opened on the sixth day and the latter on the tenth day after inoculation.

Microscopic examination of sections of the membranes of the surviving embryos showed 4 with tubercles and 25 with mesoblastic proliferation of varying degrees of intensity. The cellular aggregates of these proliferating areas were composed of cells resembling fibroblasts and monocytes (fig. 2). Basophilic polymorphonuclear cells were recognizable and eosinophils were present throughout the membrane. Proliferation of the surface epithelium (fig. 3) was present in sections of 26 membranes, with tubercle bacilli on the surface or within the epithelial cells.

B. H 37 (Phipps). In one experiment, of 40 embryos implanted with 1 mg. of bacilli of this strain, only 12 survived 10 days, but of these, 3 had large tubercles 1 to 5 mm. in diameter (fig. 5). Microscopic examination of the membranes showed that 8 out of the 12 had tubercles in various stages of development (fig. 4). All membranes showed epithelial proliferation of the outer layer with numerous bacilli within the cells. Extensive mesoblastic proliferation was present in some preparations with greater numbers of eosinophils and epithelioid aggregates as compared with the membranes implanted with bacilli from the preceding Saranac strain. Sections of 10 membranes showed clumps of bacilli within the cells deeply imbedded in the mesodermal tissue. Comparison of the incidence of tubercle formation and cell proliferation produced by this strain and the H 37 (Saranac) strain suggests that the former has at present a higher virulence.

C. A 27 (Phipps). Of 32 embryos which received 1 mg. each of bacilli of this strain, only 8 survived 6 days, but all of these had extensive tubercle formation. All membranes presented numerous tubercles ranging in size from 1 to 4 mm. in diameter (fig. 6). In every membrane microscopic examination showed these areas to be typical discrete and conglomerate tubercles (fig. 7). The epithelial proliferation was extensive, with numerous clumps of bacilli actively growing in the cells. Cell aggregates in the mesoderm were numerous and these also showed actively growing bacilli. Except in one instance, the tubercles showed typical caseation necrosis.

D. Ravenel, bovine "smooth." In two experiments with this strain the membranes of 38 embryos were implanted with 0.25, 0.5, and 1.0 mg. of bacilli per egg. Of these 11 were alive when opened. Three receiving 0.25 mg. and 6 receiving 0.5 mg. were opened 6 days after inoculation, and 2 which received 1 mg. were opened 4 days after inoculation.

Five of the 11 showed tubercles both grossly and microscopically. Two others showed visible thickenings of the membrane but these were not sufficiently advanced to be classified as tubercles. Thickening of the outer epithelial cell layer was present in all membranes and all except one showed tubercle bacilli. Proliferation in the epithelial outer cell layer often resulted in nodules protruding above the surface of the membrane (fig. 8). Mesodermal proliferation was present in all except one and in three this was extensive. Aggregates of epithelioid cells were present in all except one, and in six membranes acid-fast bacilli were found deeply imbedded in the cells of the mesoblastic layer. Caseation necrosis was not observed.

HEAT-KILLED TUBERCLE BACILLI

Of the two experiments comprising 61 eggs implanted with 1 mg. of heat-killed bacilli of the H 37 strain, 16 survived. These were opened between the sixth and ninth day after implantation. Neither gross nor microscopic tubercles were present. Five showed slight gross thickenings of the membrane, while 13 showed some cellular proliferation in the mesoderm, and epithelial thickenings with acid-fast organisms on the surface only (fig. 9). Eosinophils were present especially in areas of mesodermal proliferation. Epithelioid aggregates were present in only four instances. These also showed a few migratory clasmatocytes which appeared to have engulfed dead tubercle bacilli from the surface of the membrane.

TUBERCULIN

In order to determine whether the cellular reactions of the membrane to heat-killed bacilli were due to chemical effects or to the mechanical stimulus of clumps of dead bacilli on the surface, a series of membranes was inoculated with 2.0 mg. of tuberculin in normal salt solution. Of the 12 surviving embryos which were opened on the eighth day after inoculation none showed tubercles, but 9 showed thickening of the membrane especially near the larger blood vessels. Microscopically 11 showed distinct proliferation of the outer epithelial layer, moderate mesoblastic proliferation and marked increase in the eosinophils. Necrosis was present in the proliferated epithelial layer and a few aggregates of epithelioid cells were present in the mesodermal

tissue. The proliferation of both the outer epithelial layer as well as the mesodermal tissue, while similar in character, was slightly more extensive when the tissue was treated with tuberculin (fig. 10) than when planted with heat-killed tubercle bacilli.

DISCUSSION

In table 1 are summarized the data derived from gross and microscopic examination of sections of the chorio-allantoic membrane of the chick embryo implanted with several strains of living tubercle bacilli. In membranes implanted with H 37 (Saranac) or the Ravenel bovine "smooth" only one or two large tubercles were found. In the membranes implanted with the H 37 Phipps strain discrete large tubercles and six or seven minute tubercles were usually present (fig. 5). With the more virulent A 27 human strain the membranes were studded with numerous tubercles (fig. 6). The incidence of tubercle formation on the membranes differed greatly with the strains. In the Saranac H 37 strain only 13 percent of the membranes showed tubercles, in the Phipps H 37, 75 percent, and in the more virulent A 27, 100 percent.

Microscopic examination of the membranes gives supporting evidence of the greater virulence of strains A 27 and Phipps H 37 than the Saranac H 37. The 45-percent incidence of tubercle development

EXPLANATION OF PLATES

FIGURE 1.—Mounting block for holding instruments and egg during operation. A. Screw for clamping revolving table in position. B. Nut which raises or lowers arms of egg clamp C. C. Rubber-tipped clamp for holding egg rigidly in position. D. Support for holding sterile curved coverslip forceps. E. Holders for sterile dental reamers used for lifting exposed shell membrane. F. Holders for small toothed forceps used for removing shell and shell membrane. G. Clamp for holding drill. H. Groove holding pyrex sterile glass cover which is placed over exposed embryo while filling syringe for implantation.

FIGURE 2.—Section of membrane 6 days after implantation with live tubercle bacilli of the H 37 Saranac strain, showing clusters of monocysts (M) deep in the mesodermal layer. Encircled areas show clumps of tubercle bacilli within the cells Stain: Ziehl-Neelson and methylene blue. (X 235)

FIGURE 3.—Section of membrane 6 days after implantation with live tubercle bacilli of the H 37 Saranac strain, showing localized proliferation of only the outer epithelial layer of the chorio-allantoic membrane. Stain: Ziehl-Neelson and methylene blue. (X 87)

FIGURE 4.—Section through membrane 10 days after implantation with bacilli of H 37 (Phipps) strain, showing tubercle with caseation necrosis (A), numerous small tubercles just beginning (B), and extensive focal proliferation of epithelium of outer layer (C). Stain: Hematoxylin and eosin. (X 25)

FIGURE 5.—Gross appearance of same membrane as shown in sectioned, stained preparation (fig. 4). Tissue fixed 10 days after implantation with live tubercle bacilli of a culture of H 37 (Phipps). Numerous small nodules mark tubercles in various stages of development. (X 2).

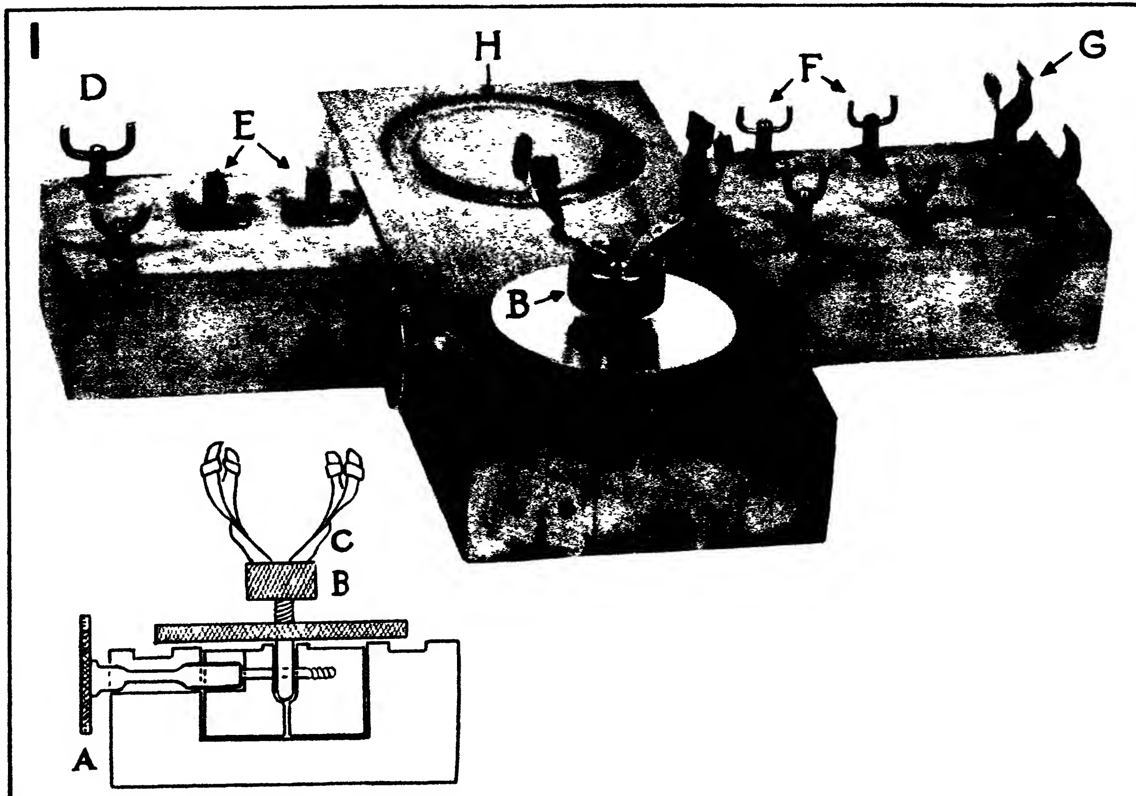
FIGURE 6.—Membrane 6 days after implantation with live tubercle bacilli of the more virulent A 27 strain, showing extensive miliary and conglomerate tubercles. (X 2½).

FIGURE 7.—Section of membrane 6 days after implantation with bacilli of the A 27 strain, showing discrete and conglomerate tubercles, many with caseation necrosis. Stain: Hematoxylin and eosin. (X 85).

FIGURE 8.—Section of membrane 6 days after implantation of bacilli of the bovine Ravenel "smooth" strain showing nodular outgrowth of epithelium and extensive tubercle formation in the mesoderm. Stain: Hematoxylin and eosin. (X 105).

FIGURE 9.—Section of membrane 7 days after implantation of heat-killed bacilli on the membrane, showing extensive mesodermal proliferation and edematous swelling. Stain: Hematoxylin and eosin. (X 96).

FIGURE 10.—Section of membrane 8 days after deposition of 0.2 cc. of 1 percent tuberculin solution on surface of outer layer, showing proliferation and necrosis of outer epithelial layer and extensive mesodermal proliferation. Stain: Hematoxylin and eosin. (X 96).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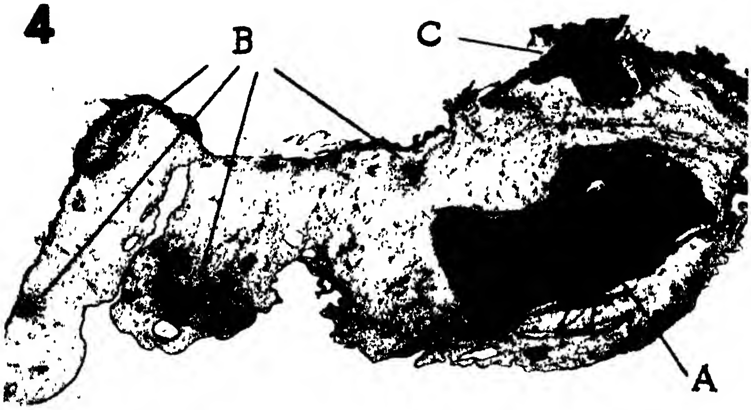
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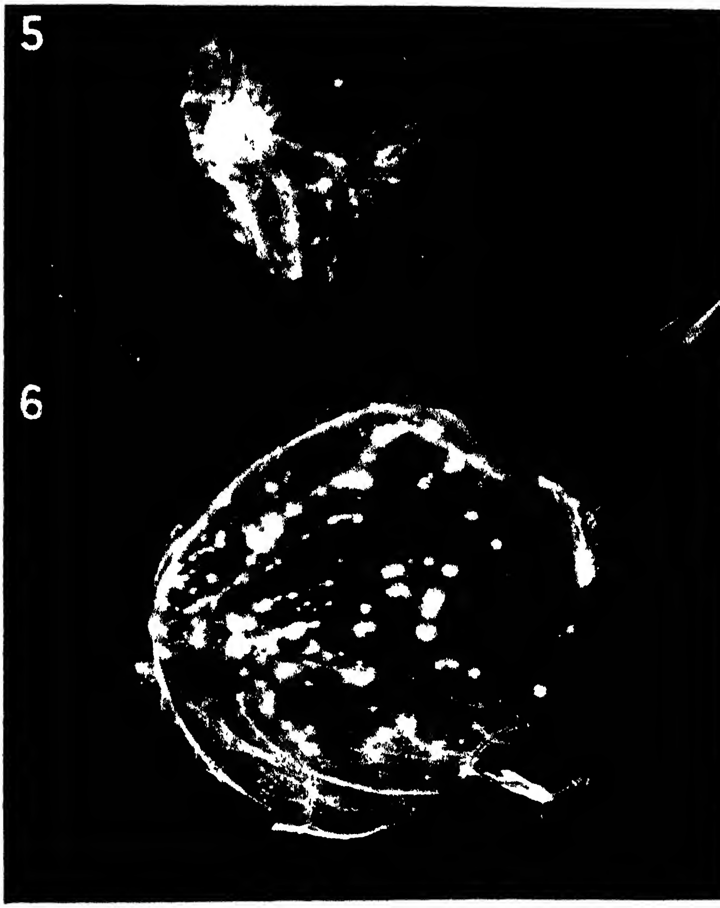

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Table 1.—*Effects of implantation of tubercle bacilli of different strains on the chorio-allantois*

Strain	Experiment No.	Dose in mg.	Days of experiment	Number of survivals	Membranes with tubercles			Number of membranes with extent of proliferation											
								Small visible opacities or thickenings				Microscopic proliferation of—							
												Epithelium				Mesoderm			
					Gross	Microscopic	Percent incidence	0	+	++	+++	0	+	++	+++	0	+	++	+++
H 37 (Saranac) Human	1	0.25	6	14	4	4	13	1	13	----	------	..	9	2	3	..	9	2	3
	2	1.00	10	15	0	0		11	4	----	------	3	11	2	------	3	11	----	------
H 37 (Phipps) Human	2	1.00	10	12	2	9	75	1	5	6	------	1	10	1	------	..	4	6	2
A 27 (Phipps) Human	4	1.00	6	8	8	8	100	..	..	----	8	..	1	3	4	..	..	----	8
Ravenel bovine (S)		.25	6	3	1	1	45	1	2	----	------	..	3	----	------	1	1	1	------
	5	.50	6	6	2	2		3	3	----	------	..	4	2	------	..	5	----	------
	..	1.00	4	2	2	2		..	..	----	------	..	..	----	2	..	..	----	3
Heat-killed H 37 (Saranac)	6	1.00	6–9	16	0	0	0	11	5	----	------	3	10	3	------	3	12	1	------
Tuberculin	7	2.00	8	12	0	0	0	3	3	6	------	1	6	4	1	..	7	4	1

0 = No proliferation.
+ = Slight.
++ = Moderate.
+++ = Extensive.

with the Ravenel strain is lower than might be expected from its high degree of pathogenicity in rabbits. It is possible that the low concentration of the suspension of bacilli used in most of those experiments might account for the low incidence of tubercle formation. It is also possible, however, that the relatively high pathogenicity of the bovine strain when injected intravenously in rabbits as compared with the human strains injected intraperitoneally or subcutaneously in guinea pigs is not a true indication of inherent virulence. Differences in the pathogenicity of different strains of tubercle bacilli might be indicated more accurately by their effects on such a structurally simple test object as the chorio-allantoic membrane.

The use of the membrane of the chick as a host for cultivating the tubercle bacillus has the added advantage of yielding tubercles within 4 to 6 days after implantation. This affords a means for checking the virulence of a strain in a few days as compared with the prolonged periods usually required for guinea pig tests. This technique, moreover, appears to afford a rapid test for the determination of changes in virulence of a given strain of bacilli that might result from variations in culture media or other causes.

Table 1 also includes experimental data with membranes implanted with heat-killed bacilli and tuberculin. The gross and microscopic examination of sections of the membrane clearly shows that no typical tubercles were formed under the influence of dead bacilli or of the purified protein derivative of the bacilli.

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The foregoing results suggest that it should be possible with this technique to determine the ability of a drug to attenuate the virulence of a given strain of tubercle bacilli, as well as to ascertain its tuberculocidal action. Such a test should be of greater value than one determining the inhibiting action of a drug on the growth of the micro-organism *in vitro*. The tests commonly employed to determine the tuberculostatic action of drugs, besides being time consuming, do not take into account the biochemical reactions between the invading micro-organism and host, nor do they give any indication as to the influence of the drug on the pathogenicity of the micro-organism, two factors of greatest importance in chemotherapy.

The technique described herein is being applied in a systematic study of the effects of various chemotherapeutic agents on the tubercle bacillus with a view to correlating chemical structure and tuberculocidal action.

SUMMARY

1. The growth of three human strains and one bovine strain of tubercle bacilli on the chorio-allantoic membrane of the chick embryo has been studied, and the cytological effects thereof described.

2. The incidence of membranes with tubercles and the extent of tubercle development on the membranes following implantation of tubercle bacilli of strains of different degrees of virulence indicate that the method may be employed in evaluating their pathogenicity.

3. No tubercles were produced on the chorio-allantoic membrane by inoculations either with tuberculin or heat-killed tubercle bacilli.

4. It is suggested that the method of implantation on the chorio-allantoic membrane is applicable to the determination, within the short space of 6 days, of the tuberculocidal action of a drug or of its ability to attenuate the virulence of a given strain of tubercle bacilli. Further work along these lines is in progress.

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MEASLES

The periodicity with which measles occurs in epidemic form is a well-known characteristic of the disease. Greater regularity is shown for cities, where the cycle is about 2 years, and for States than for the country as a whole, for which the total incidence is influenced

by the concurrence or nonconcurrence of various local cycles. Since 1920, periodically high incidence of measles has occurred in the United States as a whole at intervals of 2 or 3 years. On the basis of reported cases, the highest incidence rate since 1920, namely, 772 cases per 100,000 population, was recorded in 1923. This rate, however, was based on reports from only 31 States (population 87,604,000). It is possible that, had the data included all States, the case rate would have been lower. The next highest incidence was recorded in 1934 and 1938, namely, 632 cases per 100,000 population for each of those years. In the epidemics of 1923 and 1934, the unusually high incidence was carried over into the following years. One year of low incidence, the lowest recorded for the United States as a whole, followed 1924, while 2 years of low incidence followed 1935.

The reporting of measles has probably improved in recent years as only 72 cases were reported for each death registered in 1923, whereas since 1935 more than 200 cases have been reported for each death. Other factors in the control and treatment of measles have also no doubt contributed to a lower case fatality.

To date (first 24 weeks), 772,231 cases of measles have been reported in the United States during the current year as compared with 718,564 cases for the corresponding period in 1938, the most recent prior epidemic year, when 822,811 cases were reported for the entire year.

The same geographic areas which recorded the highest case rates in 1938 have also recorded the highest rates to date in 1941, namely, the East North Central, the Middle Atlantic, and the South Atlantic, with the Mountain and East South Central States next in order in each of those years. The lowest rates were shown for the West South Central, New England, and Pacific areas in 1938 and for the same areas and the West North Central States so far in 1941. In both of the interepidemic years of 1939 and 1940 the highest case rates were recorded for the New England, Mountain, and Pacific States. The highest case fatality rates are shown for the nonepidemic years.

Although the mortality from measles has fluctuated widely from year to year, it has declined rapidly during the present century, especially since 1920. In 1900 the crude death rate for measles in the death registration area of the United States was 12.5 per 100,000 population. The average rates for the expanding registration area by 10-year periods have been as follows: 1900–1910, 10.6 per 100,000; 1911–1920, 9.1; 1920–1930, 5.3; 1931–1939, 2.3. The highest annual death rate for measles in the expanding death registration area during this period was 14.3 in 1917 and the lowest 0.9 in 1939. The rate for 1939 represents a reduction of 93 percent from the rate for 1900. The death rate for measles in a group of large cities in the United States was approximately 24 per 100,000 population in 1885 and 36 in 1887.

In 1939 there were only 1,174 deaths from measles in the United States, in which year 403,037 cases were reported to the United States Public Health Service by the State health officers. A total of 291,162 cases was reported in 1940, which may indicate a still lower death rate for the disease in that year than in 1939. The high current incidence of the disease probably portends a corresponding rise in measles mortality for 1941.

Mortality from measles has been greatly reduced in spite of the lack of a general specific prophylaxis, such as has been made available for diphtheria, typhoid fever, and other diseases. The explanation must therefore be found in other measures. Among these are no doubt better methods of control, such as prevention of exposure of babies under 3 or 4 years of age, more nearly adequate medical attention, the use of convalescent serum and other means to ameliorate the disease, better nursing care, and the isolation of very young children to protect them against a secondary infection.

While the use of measles convalescent serum has not yet been widely adopted as a prophylactic measure, except in certain large cities, it has apparently been proved to be a valuable agent in modifying the course of the disease and has probably saved many lives. Experience during the present epidemic in New York City, where convalescent serum has been made available to all physicians, has clearly demonstrated its usefulness.[1] Of approximately 8,000 children who receive protective doses of the serum, 60 to 80 percent (complete figures not yet available) did not develop measles, and from 20 to 40 percent developed only a mild, modified attack. Only about seven-tenths of 1 percent developed the unmodified disease. It is estimated that approximately 85 percent of them would have developed an unmodified attack, with the possibility of serious complications, if they had not received injections of serum, as all of the children who were given the serum had been in contact with a case of measles.

The average dose was 5 to 10 cc., injected intramuscularly. Because of the risk from measles in children up to the age of 3, it was recommended that the attempt be made completely to prevent the disease in this age group by using 5 cc. dosage for infants up to 1 year of age and 10 cc. for children aged 2 and 3 years, not later than the seventh day after exposure. For children over 3 years of age, 5 to 10 cc. up to 6 or 7 days after the first exposure was the modifying dose.

During the present outbreak, 50 liters of convalescent serum were processed and distributed by the laboratory affiliated with the New York City Department of Health. This was obtained from 100 liters of whole blood taken from 750 convalescent donors, who are paid $5.00 per bleeding. The serum is available at all times upon the request of a physician.

[1] Quarterly Bulletin, City of New York Department of Health, May 1941, pp. 35-38.

COURT DECISION ON PUBLIC HEALTH

Enforcement of milk ordinance not enjoined.—(California District Court of Appeal, First District; *Natural Milk Producers Ass'n of California et al.* v. *City and County of San Francisco et al.*, 112 P.2d 930; decided May 1, 1941.) In a suit in which the plaintiffs were not successful in having enjoined the enforcement of certain provisions of a milk ordinance of the city and county of San Francisco, some of the matters considered by the court were as stated below.

One provision of the ordinance was that (*a*) certified milk, (*b*) guaranteed pasteurized milk, (*c*) grade A pasteurized milk, and (*d*) grade B pasteurized milk, and no other milk should be sold for human consumption. The plaintiffs claimed that the prohibition of the sale of nonpasteurized guaranteed raw milk and grade A milk was void because in conflict with a general statute, the agricultural code. But the court said that it did not find a single provision of the general statutes which stated in effect that guaranteed milk, grade A milk, and grade B milk need not be pasteurized before being sold in San Francisco.

Regarding a contention that the ordinance granted special privileges and immunities to certain vendors which were denied to others, the court said that, as there was nothing in the ordinance that would have prevented any one of the plaintiffs from applying for a permit to sell any one of the grades of milk mentioned, it was patent that they could not assert that any special privilege had been granted to others which had been denied to them.

Another claim of the plaintiffs was that the ordinance contained invalid provisions delegating legislative powers. The provision regarding certified milk stated that such milk was market milk which conformed to the "rules, regulations, methods and standards for the production and distribution of certified milk adopted by the American Association of Medical Milk Commissions" and had to bear the certification of the milk commission of the San Francisco County Medical Society. It was argued that under this provision the American Association of Medical Milk Commissions was delegated the power to set the qualifications of certified milk. The court, however, found no merit in this contention. It said that, assuming that the association may from time to time change its rules and regulations and that certified milk would be greatly depressed in quality, the plaintiffs were not purchasers and could not complain. Also it was stated that the argument that the association may so amend its rules and regulations as to impose additional burdens on vendors of certified milk led nowhere. Finally the court said that, solely for the purposes of the instant decision, it would assume that the insertion of the words "rules, regulations," rendered said section invalid, but then went on

to say that those words could be stricken out without in any manner affecting the rest of the ordinance.

Another contention of the plaintiffs dealt with the fact that the ordinance did not require certified milk, which was raw milk, to be pasteurized but did require all other grades of raw milk to be pasteurized. They asserted that the ordinance created two classes between which there was no "natural, constitutional, or intrinsic distinction." But the court said: "The record contains nothing which would warrant this court in holding that, as defined in said ordinance, certified milk is not as wholesome or more wholesome than any of the other grades of milk after they have been pasteurized. That being so no reason appears why certified milk should be pasteurized, no objection appears why the other grades of milk specified in the ordinance should not be pasteurized, and a valid distinction exists between certified milk (not pasteurized) and other grades required to be pasteurized."

Finally the court rejected the theory of the plaintiffs that the ordinance was unreasonable and, therefore, void. The trial court had found that allegation not true and the appellate court would not disturb its findings.

DEATHS DURING WEEK ENDED JUNE 7, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended June 7, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,044	8,579
Average for 3 prior years	8,013	
Total deaths, first 23 weeks of year	206,756	208,252
Deaths per 1,000 population, first 23 weeks of year, annual rate	12.6	12.6
Deaths under 1 year of age	479	526
Average for 3 prior years	498	
Deaths under 1 year of age, first 23 weeks of year	12,091	11,695
Data from industrial insurance companies:		
Policies in force	64,469,440	65,353,394
Number of death claims	11,772	12,771
Death claims per 1,000 policies in force, annual rate	9.5	10.2
Death claims per 1,000 policies, first 23 weeks of year, annual rate	10.2	10.4

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JUNE 14, 1941

Summary

As compared with the preceding week, a decrease was reported for the current week in the incidence of each of the 9 communicable diseases included in the following table with the single exception of typhoid fever. While the number of reported cases of typhoid fever increased from 128 to 161, the current figure is below that for the corresponding week of each of the 5 preceding years except 1940. The current incidence of each of these 9 diseases, with the exception of influenza, measles, and whooping cough, is below the 5-year (1936–40) median expectancy.

The number of reported cases of measles decreased from 28,588 for the preceding week to 21,420. The incidence declined in all geographic areas except the New England States. A total of 772,231 cases has been reported to date this year (first 24 weeks), as compared with 718,564 for the corresponding period in 1938.

The number of cases of poliomyelitis declined from 32 for the preceding week to 26, of which 6 cases were reported in California, 3 cases each in Pennsylvania, Illinois, and Florida, 2 cases each in New York, Michigan, and Mississippi. No cases were reported in the New England, West North Central, and Mountain States.

A total of 23 cases of Rocky Mountain spotted fever was reported—5 in the eastern States, 3 in Iowa, and the remainder in the Mountain States. Of 50 cases of endemic typhus fever, 22 cases were reported in Texas and 17 in Georgia.

The death rate for the current week for 88 major cities in the United States was 10.9 per 1,000 population, as compared with 11.2 for the preceding week and with a 3-year (1938–40) average of 10.8. The cumulative rate to date this year is 12.5 as compared with 12.6 for the corresponding period of 1940. (All rates are on an annual basis.)

Telegraphic morbidity reports from State health officers for the week ended June 14, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936-40	Week ended—		Median 1936-40	Week ended—		Median 1936-40	Week ended—		Median 1936-40
	June 14, 1941	June 15, 1940		June 14, 1941	June 15, 1940		June 14, 1941	June 15, 1940		June 14, 1941	June 15, 1940	
NEW ENG.												
Maine	0	1	1	4	2	------	155	305	81	0	0	0
New Hampshire	0	0	0	------	------	------	20	6	33	0	0	0
Vermont	1	0	0	------	------	------	74	8	47	0	0	0
Massachusetts	3	4	2	------	------	------	1,038	1,455	1,015	5	0	1
Rhode Island	1	0	0	------	------	------	1	201	26	0	0	1
Connecticut	0	1	1	1	1	------	631	31	72	0	1	1
MID. ATL.												
New York	13	16	16	[1] 2	[1] 1	[1] 3	2,205	994	1,511	4	4	4
New Jersey [2]	6	1	10	4	8	4	1,343	1,287	547	0	0	1
Pennsylvania	11	15	15	------	------	------	3,477	496	875	3	3	7
E. NO. CEN.												
Ohio	3	9	11	8	12	12	1,371	53	725	3	1	1
Indiana	13	4	4	8	5	3	328	16	16	0	2	1
Illinois	11	19	26	5	5	10	761	223	223	2	2	2
Michigan [3]	3	2	5	2	1	1	1,242	793	301	1	0	1
Wisconsin	1	1	1	27	15	11	1,690	1,111	457	0	0	1
W. NO. CEN.												
Minnesota	3	1	1	2	2	2	17	86	138	0	0	0
Iowa [2]	2	5	2	3	------	------	257	87	87	0	0	1
Missouri	2	2	5	1	1	2	324	21	21	0	0	0
North Dakota	0	3	1	------	------	------	21	3	3	0	0	0
South Dakota	0	0	0	------	1	------	2	2	2	0	0	0
Nebraska	1	0	1	------	------	------	20	7	19	0	0	0
Kansas	5	1	3	4	1	1	203	242	59	0	1	0
SO. ATL.												
Delaware [2]	1	0	0	------	------	------	29	3	5	0	0	0
Maryland [2] [3]	3	0	2	3	------	1	473	9	120	2	0	0
Dist. of Col.	2	0	3	------	------	------	184	6	93	0	0	3
Virginia	6	5	7	85	34	------	798	158	181	1	0	1
West Virginia [3]	8	2	3	4	7	9	398	10	75	1	0	1
North Carolina	3	6	7	------	------	------	852	112	196	0	0	3
South Carolina	12	3	8	105	95	56	514	16	30	0	0	2
Georgia [4]	4	1	2	4	9	------	207	43	43	0	1	0
Florida [4]	1	2	6	11	------	------	84	16	16	1	0	0
E. SO. CEN.												
Kentucky	3	2	4	1	2	5	420	95	65	1	1	1
Tennessee [4]	0	2	4	24	21	18	242	85	85	0	0	2
Alabama [4]	8	1	3	14	10	8	149	31	31	1	1	1
Mississippi [3]	3	0	8	------	------	------	------	------	------	1	0	0
W. SO. CEN.												
Arkansas	6	3	3	4	28	10	125	28	28	0	0	1
Louisiana	0	0	10	4	9	10	18	1	10	2	1	3
Oklahoma	3	5	2	15	13	17	116	22	46	0	1	1
Texas [4]	4	14	28	245	100	100	516	669	239	0	2	1
MOUNTAIN												
Montana [2]	2	2	0	------	------	------	26	50	50	0	0	0
Idaho	0	0	0	------	------	------	4	31	22	0	0	0
Wyoming [2]	3	1	0	1	------	------	8	34	8	0	0	0
Colorado [2]	8	10	6	21	------	------	162	26	47	0	0	0
New Mexico	3	0	2	------	------	1	79	67	56	0	0	0
Arizona	1	2	2	52	50	20	96	71	16	0	1	0
Utah [2]	3	0	0	14	------	------	23	292	92	0	0	0
Nevada [2]	0	------	------	1	------	------	101	------	------	0	------	------
PACIFIC												
Washington	2	2	2	------	------	------	14	187	187	0	0	0
Oregon	0	5	1	3	5	7	52	111	56	0	0	0
California	11	20	25	126	23	110	555	260	1,017	3	3	3
Total	179	173	289	803	456	540	21,420	9,768	9,289	31	25	50
24 weeks	6,214	7,427	10,995	593,070	165,861	148,631	772,231	193,411	238,920	1,124	934	1,813

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 14, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	June 14, 1941	June 15, 1940		June 14, 1941	June 15, 1940		June 14, 1941	June 15, 1940		June 14, 1941	June 15, 1940	
NEW ENG.												
Maine	0	0	0	4	0	6	0	0	0	1	1	1
New Hampshire	0	0	0	3	1	3	0	0	0	0	0	0
Vermont	0	1	0	3	1	5	0	0	0	0	0	0
Massachusetts	0	0	1	157	95	137	0	0	0	1	1	1
Rhode Island	0	0	0	6	4	11	0	0	0	0	1	1
Connecticut	0	0	0	45	48	62	0	0	0	0	1	1
MID. ATL.												
New York	2	1	2	348	389	407	0	0	0	15	7	9
New Jersey [2]	1	1	1	139	147	101	0	0	0	6	2	2
Pennsylvania	3	1	1	186	195	204	0	0	0	16	9	12
E. NO. CEN.												
Ohio	0	0	0	170	142	155	2	0	2	7	4	8
Indiana	0	1	0	43	37	51	0	10	9	4	3	3
Illinois	3	1	1	154	444	319	2	14	13	5	3	6
Michigan [3]	2	0	0	191	211	257	1	0	1	2	1	4
Wisconsin	0	0	0	82	79	90	1	14	5	0	0	1
W. NO. CEN.												
Minnesota	0	0	0	48	44	44	1	0	3	3	0	0
Iowa [3]	0	0	0	26	28	49	10	10	19	0	1	3
Missouri	0	0	1	40	46	46	1	2	10	2	12	7
North Dakota	0	0	0	3	2	10	0	18	9	0	0	0
South Dakota	0	1	0	3	3	8	3	1	7	0	1	0
Nebraska	0	0	0	14	2	6	0	1	1	2	0	0
Kansas	0	2	0	14	21	30	0	1	7	1	3	2
SO. ATL.												
Delaware [3]	0	0	0	10	2	3	0	0	0	0	0	0
Maryland [2] [3]	0	0	0	32	20	20	0	0	0	5	2	3
Dist. of Col.	0	0	0	5	12	7	0	0	0	0	1	0
Virginia	0	0	0	9	25	18	0	0	0	3	3	13
West Virginia [3]	0	0	0	18	23	22	0	1	0	2	3	4
North Carolina	1	0	2	9	11	18	0	0	0	7	0	4
South Carolina	1	0	0	2	0	0	0	1	0	6	1	8
Georgia [4]	0	0	0	9	6	6	0	0	0	5	13	18
Florida [4]	3	1	1	1	2	5	0	0	0	8	4	4
E. SO. CEN.												
Kentucky	0	1	0	34	21	17	0	0	0	5	2	9
Tennessee [4]	1	1	1	29	26	15	1	0	0	1	2	12
Alabama [4]	0	1	1	10	6	5	0	1	0	0	3	5
Mississippi [3]	2	0	0	0	4	5	0	0	0	5	2	3
W. SO. CEN.												
Arkansas	0	0	0	2	4	4	0	0	0	5	7	7
Louisiana	1	0	1	5	10	8	0	0	0	16	11	11
Oklahoma	0	1	1	9	16	13	2	0	1	1	10	11
Texas [4]	0	0	2	21	18	28	0	2	5	11	18	18
MOUNTAIN												
Montana [3]	0	0	0	9	5	8	0	0	0	0	0	1
Idaho	0	0	0	5	2	5	0	0	0	0	2	2
Wyoming [3]	0	0	0	1	5	5	0	0	2	0	0	0
Colorado [3]	0	0	0	22	13	20	0	1	1	2	1	1
New Mexico	0	0	0	3	5	15	0	0	0	3	4	4
Arizona	0	0	0	3	3	3	0	0	0	2	0	1
Utah [3]	0	0	0	3	5	12	0	0	0	0	1	0
Nevada [3]	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	17	0	20	31	25	1	0	2	1	3	3
Oregon	0	0	0	9	6	16	0	1	5	3	1	1
California	6	11	6	84	105	138	0	0	14	5	10	10
Total	26	42	42	2,043	2,325	2,698	25	78	196	161	154	282
24 weeks	569	646	575	83,604	109,589	126,575	1,065	1,685	7,078	2,101	2,242	3,069

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 14, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— June 14, 1941	Whooping cough, Week ended— June 15, 1940
NEW ENG.		
Maine	20	18
New Hampshire	11	2
Vermont	10	15
Massachusetts	267	156
Rhode Island	33	10
Connecticut	81	44
MID. ATL.		
New York	293	259
New Jersey [2]	110	88
Pennsylvania	294	257
E. NO. CEN.		
Ohio	305	300
Indiana	34	27
Illinois	82	96
Michigan [3]	240	237
Wisconsin	144	100
W. NO. CEN.		
Minnesota	94	21
Iowa [2]	33	23
Missouri	10	55
North Dakota	17	15
South Dakota	3	0
Nebraska	10	8
Kansas	142	43
SO. ATL.		
Delaware [2]	1	7
Maryland [2, 3]	76	152
Dist. of Col.	16	5
Virginia	67	56
West Virginia [3]	58	31
SO. ATL.—continued		
North Carolina	251	122
South Carolina	131	17
Georgia [4]	18	54
Florida [4]	32	5
E. SO. CEN.		
Kentucky	33	107
Tennessee [4]	86	59
Alabama [4]	51	19
Mississippi [3]		
W. SO. CEN.		
Arkansas	33	17
Louisiana	3	76
Oklahoma	25	27
Texas [4]	294	261
MOUNTAIN		
Montana [2]	13	0
Idaho	21	11
Wyoming [2]	13	3
Colorado [2]	173	5
New Mexico	13	45
Arizona	52	48
Utah [3]	97	179
Nevada [2]	0	
PACIFIC		
Washington	127	56
Oregon	17	35
California	735	471
Total	4,669	3,642
24 weeks	110,979	76,890

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended June 14, 1941, 23 cases, as follows: New Jersey, 1; Iowa, 3; Delaware, 1; Maryland, 3; Montana, 5; Wyoming, 6; Colorado, 3; Nevada, 1.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended June 14, 1941, 50 cases, as follows: Georgia, 17; Florida, 5; Tennessee, 2; Alabama, 4; Texas, 22.

PLAGUE INFECTION IN CALIFORNIA, IDAHO, AND OREGON

Under dates of June 3 and 5, 1941, N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved as follows:

IN FLEAS FROM RATS IN SAN FRANCISCO, CALIF.

A pool of 31 fleas collected from 2 rats (*Rattus norvegicus*) caught on March 21, 1941, in the vicinity of the 1200 block of Folsom Street, San Francisco, Calif., produced plague in guinea pigs inoculated May 8, 1941.

The report of the Director of Public Health of San Francisco calls attention to the unusually long period during which the plague organism remained viable in these fleas under laboratory conditions—from March 21 to May 8.

IN FLEAS FROM GROUND SQUIRRELS IN KERN COUNTY, CALIF.

In a pool of 204 fleas from 17 ground squirrels, *C. beecheyi*, submitted to the laboratory on May 26 from the California Institute for Women, 6 miles west of Tehachapi, Kern County, Calif., and in another pool of 106 fleas from 17 ground squirrels, *C. beecheyi*, submitted to the laboratory on May 23 from a ranch 1 mile south of the California Institute for Women.

IN FLEAS FROM GROUND SQUIRRELS IN ADA COUNTY, IDAHO

In a pool of 105 fleas from 44 ground squirrels, *C. mollis* (sp.), shot on May 21 and 23, 2 miles north and 3 miles east of the junction of State Highways Nos. 16 and 44, and in another pool of 20 fleas from 12 ground squirrels of the same species shot on May 22 on the edge of the desert west of Boise Air Base, both in Ada County, Idaho.

IN FLEAS FROM MARMOT IN MALHEUR COUNTY, OREG.

In a pool of 27 fleas from 1 marmot, *Marmota flaviventris avara*, shot May 16, 12 miles southwest of Jordan Valley, Malheur County, Oreg.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 31, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	111	49	24	4,228	408	1,507	15	372	28	1,197	-------
Current week [1]	48	38	17	6,705	284	1,015	1	335	18	1,297	-------
Maine:											
Portland	0	------	0	6	3	0	0	1	0	11	22
New Hampshire:											
Concord	0	------	0	1	0	0	0	0	0	0	6
Manchester	0	------	0	0	0	3	0	1	0	0	22
Nashua	0	------	0	0	0	0	0	0	0	3	3
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	3
Burlington	0	------	0	2	0	0	0	0	0	0	10
Rutland	0	------	0	0	1	0	0	0	0	0	6
Massachusetts:											
Boston	2	------	0	196	9	64	0	5	0	62	203
Fall River	0	------	0	3	2	4	0	0	0	9	40
Springfield	0	------	0	54	1	11	0	0	1	6	36
Worcester	0	------	0	12	3	2	0	1	0	6	43
Rhode Island:											
Pawtucket	0	------	0	2	0	3	0	0	0	2	14
Providence	0	------	0	0	1	1	0	0	0	18	45
Connecticut:											
Bridgeport	0	------	0	25	1	1	0	0	0	2	23
Hartford	0	------	0	6	1	5	0	0	0	6	32
New Haven	0	------	0	5	1	6	0	1	0	1	35
New York:											
Buffalo	0	------	0	68	5	25	0	5	0	16	112
New York	9	1	3	949	66	204	0	73	1	66	1,339
Rochester	1	------	0	237	2	1	0	0	2	33	56
Syracuse	0	------	0	1	3	2	0	0	0	26	37
New Jersey:											
Camden	1	1	1	5	3	2	0	0	0	10	24
Newark	0	------	0	90	3	32	0	5	0	21	94
Trenton	0	------	0	50	0	15	0	3	0	0	31
Pennsylvania:											
Philadelphia	1	1	0	226	10	117	0	21	2	76	416
Pittsburgh	1	1	0	1,026	8	15	0	5	1	38	156
Reading	1	------	0	63	0	7	0	0	0	4	19
Scranton	0	------	--------	27	------	0	0	------	0	0	-------
Ohio:											
Cincinnati	4	------	0	47	2	10	0	4	0	7	110
Cleveland	0	3	0	42	7	46	0	9	0	74	195
Columbus	0	------	0	46	0	8	0	0	0	4	67
Toledo	0	------	0	437	2	2	0	5	1	14	64
Indiana:											
Anderson	0	------	0	13	2	0	0	0	0	0	10
Fort Wayne	0	------	0	5	1	0	0	0	0	4	18
Indianapolis	2	------	1	457	11	14	0	9	0	16	114
Muncie	0	------	0	39	2	5	0	0	0	2	20
South Bend	0	------	0	31	0	1	0	0	0	3	22
Terre Haute	------	------	1	------	3	------	------	1	------	------	28
Illinois:											
Alton	0	------	0	4	0	0	0	0	1	0	9
Chicago	15	1	1	201	23	109	0	37	0	35	693
Elgin	0	------	0	3	0	0	0	1	0	0	10
Moline	0	------	0	19	0	0	0	0	0	0	8
Springfield	0	------	0	39	2	4	0	0	0	0	21
Michigan:											
Detroit	0	------	0	415	15	100	0	10	0	93	260
Flint	0	------	0	21	4	6	0	0	0	7	25
Grand Rapids	0	------	0	121	0	7	0	1	0	6	23
Wisconsin:											
Kenosha	0	------	0	44	0	2	0	0	0	0	4
Madison	0	------	0	37	0	3	0	0	0	0	16
Milwaukee	0	------	0	507	1	21	0	1	0	47	84
Racine	0	------	0	30	0	0	0	0	0	6	7
Superior	0	------	0	3	0	0	0	0	0	10	8

[1] Figures for Tampa and morbidity figures for Terre Haute estimated; reports not received.

City reports for week ended May 31, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0		0	0	2	0	0	0	0	8	19
Minneapolis	0		0	10	0	19	0	1	0	30	87
St. Paul	0		0	1	1	5	0	3	0	14	55
Iowa:											
Cedar Rapids	0			3		0	0		0	0	
Des Moines	0			7		1	0		0	0	35
Sioux City	0			12		1	0		0	9	
Waterloo	0			21		0	0		0	10	
Missouri:											
Kansas City	0		0	89	4	4	1	3	0	10	81
St. Joseph	0		0	6	4	0	0	0	0	0	22
St. Louis	0		0	225	5	32	0	8	1	22	198
North Dakota:											
Fargo	0		0	1	1	0	0	0	0	1	12
Grand Forks	0			0		0	0		0	0	
Minot	0			13		0	0		0	0	9
South Dakota:											
Aberdeen	0			0		0	0		0	0	
Sioux Falls	0			0		3	0		0	0	7
Nebraska:											
Omaha	0		0	10	3	6	0	3	0	4	39
Kansas:											
Lawrence	0	1	0	2	0	0	0	0	0	0	3
Topeka	2		0	31	3	0	0	0	0	25	22
Wichita	0	2	0	3	1	2	0	1	0	2	30
Delaware:											
Wilmington	0		0	4	0	6	0	0	0	0	25
Maryland:											
Baltimore	0	3	3	250	14	32	0	15	0	77	243
Cumberland	0		0	1	2	1	0	0	0	2	17
Frederick	0		0	0	0	0	0	0	0	0	2
Dist. of Col.											
Washington	1		0	204	10	11	0	12	0	10	165
Virginia:											
Lynchburg	0		0	33	0	0	0	0	0	7	9
Norfolk	0	1	0	34	3	1	0	3	0	1	27
Richmond	0		0	58	0	2	0	1	0	0	38
Roanoke	0		0	5	1	0	0	0	0	0	18
West Virginia:											
Charleston	1		0	0	2	2	0	0	0	0	14
Huntington	0			12		0	0		0	0	
Wheeling	0		0	90	0	3	0	1	0	4	14
North Carolina:											
Gastonia	0			11		0	0		0	3	
Raleigh	0		0	23	0	1	0	0	0	23	7
Wilmington	0		0	22	0	0	0	0	0	5	5
Winston-Salem	0		0	14	2	1	0	2	0	5	22
South Carolina:											
Charleston	0	3	0	0	2	0	0	1	0	0	17
Florence	0	3	0	1	0	0	0	0	0	5	3
Greenville	0		0	1	5	0	0	1	0	3	29
Georgia:											
Atlanta	0	3	0	28	1	0	0	6	0	0	87
Brunswick	0		0	0	0	0	0	0	0	4	2
Savannah	0		0	6	0	2	0	0	0	1	32
Florida:											
Miami	0	1	0	10	1	0	0	0	0	10	29
St. Petersburg	0		0	9	1	0	0	0	0	1	8
Tampa											
Kentucky:											
Ashland	0		0	0	1	0	0	0	0	2	5
Covington	0		0	1	1	0	0	0	0	0	12
Lexington	0		0	0	1	1	0	3	0	1	12
Louisville	0		0	484	4	28	0	3	2	16	63
Tennessee:											
Knoxville	0		0	26	0	2	0	3	0	0	29
Memphis	0		1	102	0	1	0	10	0	22	78
Nashville	0		0	28	3	6	0	1	0	12	44
Alabama:											
Birmingham	0		1	63	5	5	0	3	2	2	85
Mobile	0		1	0	1	0	0	1	0	0	24
Montgomery	1			10		0	0		0	0	
Arkansas:											
Fort Smith	0			5		0	0		0	0	
Little Rock	0		0	3	3	0	0	4	0	1	40

City reports for week ended May 31, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
New Orleans	0	1	1	3	5	0	0	10	2	0	131
Shreveport	0	------	0	0	0	0	0	2	0	0	35
Oklahoma:											
Oklahoma City	0	1	0	14	3	5	0	0	0	0	38
Tulsa	0	------	0	27	0	1	0	1	0	0	25
Texas:											
Dallas	0	------	0	18	1	2	0	2	0	2	70
Fort Worth	0	------	1	12	0	0	0	0	0	6	37
Galveston	0	------	0	0	2	0	0	1	0	0	10
Houston	0	------	0	2	2	0	0	8	2	1	72
San Antonio	1	3	0	1	1	1	0	8	0	0	63
Montana:											
Billings	0	------	0	1	0	1	0	0	0	0	10
Great Falls	0	------	0	0	0	0	0	0	0	0	9
Helena	0	------	0	2	0	0	0	0	0	0	5
Missoula	0	------	0	0	0	0	0	0	0	0	1
Idaho:											
Boise	0	------	0	0	2	0	0	1	0	0	6
Colorado:											
Colorado Springs	0	------	0	4	0	5	0	1	0	5	7
Denver	3	7	2	273	0	2	0	4	1	119	90
Pueblo	0	------	0	7	0	1	0	0	0	8	7
New Mexico:											
Albuquerque	0	------	0	9	0	0	0	3	0	0	14
Arizona:											
Phoenix	0	23	--------	2	-------	1	0	-------	0	2	--------
Utah:											
Salt Lake City	0	------	0	2	0	1	0	1	0	16	21
Washington:											
Seattle	0	------	1	0	2	0	0	5	0	27	97
Spokane	0	------	0	3	2	1	0	0	1	3	30
Tacoma	0	------	0	2	0	0	0	0	0	8	24
Oregon:											
Portland	0	2	0	5	2	1	0	0	0	2	49
Salem	0	------	--------	3	-------	0	0	-------	0	0	--------
California:											
Los Angeles	0	7	0	35	2	18	0	17	0	34	295
Sacramento	3	------	0	5	1	2	0	2	1	30	31
San Francisco	0	1	0	5	2	3	0	6	0	34	159

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				**Michigan:**			
Fall River	0	1	0	Detroit	1	0	0
Rhode Island:				**Minnesota:**			
Providence	1	0	0	Minneapolis	0	0	1
New York:				**District of Columbia:**			
Buffalo	4	0	0	Washington	1	1	0
New York	2	1	0	**Florida:**			
Pennsylvania:				Miami	0	0	3
Pittsburgh	1	0	0	**California:**			
Ohio:				Los Angeles	0	0	2
Toledo	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: Cumberland, 1.
Pellagra.—Cases: Chicago, 1; Charleston, S. C., 2; Atlanta, 1; Savannah, 3; Miami, 1; Houston, 2.
Typhus fever.—Cases: Miami, 1; St. Petersburg, 1; Los Angeles, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 17, 1941.—During the week ended May 17, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	2	2		6	12	3	1	1	1	28
Chickenpox		23		113	207	51	25	19	52	490
Diphtheria		23	3	26	9		1		1	63
Dysentery				8						8
Influenza		22			3	1			14	40
Measles		68	10	525	1,537	60	88	77	178	2,543
Mumps				328	174	28	17	5	15	565
Pneumonia	3	16			16	3			10	48
Scarlet fever		42	6	80	179	7	9	14	20	357
Trachoma									5	5
Tuberculosis	4	13	19	78	65	3	10			192
Typhoid and paratyphoid fever			1	16				1	3	21
Whooping cough		5		103	170	3	5	4	25	315

FINLAND

Communicable diseases—March 1941.—During the month of March 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	221	Poliomyelitis	11
Dysentery	2	Scarlet fever	343
Influenza	3,398	Typhoid fever	54
Paratyphoid fever	150	Undulant fever	1

SWEDEN

Notifiable diseases—March 1941.—During the month of March 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	8	Poliomyelitis	1
Diphtheria	8	Scarlet fever	1,006
Dysentery	41	Syphilis	19
Epidemic encephalitis	2	Typhoid fever	11
Gonorrhea	659	Undulant fever	11
Paratyphoid fever	6		

SWITZERLAND

Communicable diseases—February 1941.—During the month of February 1941, cases of certain communicable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	26	Paratyphoid fever	4
Chickenpox	222	Poliomyelitis	10
Diphtheria	166	Scarlet fever	201
German measles	118	Tuberculosis	253
Influenza	130	Typhoid fever	3
Measles	386	Undulant fever	5
Mumps	107	Whooping cough	136

UNION OF SOUTH AFRICA

Notifiable diseases—Years ended June 30, 1940, and June 30, 1939.—During the years ended June 30, 1940, and June 30, 1939, cases of certain notifiable diseases were reported by medical practitioners in the Union of South Africa as follows:

Disease	1940	1939	Disease	1940	1939
Anthrax	65	71	Puerperal fever	600	564
Cerebrospinal meningitis	808	702	Rabies	2	2
Diphtheria	3,050	3,480	Scarlet fever	2,040	1,945
Encephalitis, infectious	30	21	Smallpox	681	408
Erysipelas	404	428	Trachoma	136	85
Lead poisoning	2	6	Tuberculosis	15,162	13,171
Leprosy	776	657	Typhoid fever	2,835	3,558
Ophthalmia neonatorum	578	640	Typhus fever	841	1,273
Plague	47	77	Undulant fever	14	9
Poliomyelitis	62	37			

Vital statistics—Year 1939.—Following are vital statistics of the European population of the Union of South Africa for the calendar year 1939:

Population	2,116,500	Deaths per 100,000 population from:	
Births per 1,000 population	25.29	Cancer	104.75
Deaths per 1,000 population	9.40	Bronchitis and pneumonia	90.05
Deaths of infants under 1 year per 1,000 live births	49.48	Diseases of the heart and circulatory system	170.42
		Tuberculosis (all forms)	36.19

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of May 30, 1941, pages 1187–1189. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Brazil.—Plague has been reported in Brazil as follows: For the month of November 1940, Alagoas State, 4 cases, 1 death; Bahia State, 1 case, 1 death; Pernambuco State, 23 cases, 4 deaths. For the month of December 1940, Alagoas State, 2 cases; Bahia State, 3 cases, 3 deaths; Pernambuco State, 6 cases, 1 death.

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Public Health Reports

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IN THIS ISSUE

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1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Public Health Reports

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MEDICAL EVALUATION OF NUTRITIONAL STATUS[1]

IV. The Ocular Manifestations of Avitaminosis A, With Especial Consideration of the Detection of Early Changes by Biomicroscopy

By H. D. Kruse, M. D.

This paper, in the series on the medical evaluation of nutritional status with emphasis on the recognition of early impairment, presents a preliminary report of observations on ocular changes in avitaminosis A as seen in the gross and with the biomicroscope, and particularly the biomicroscopic examination of the conjunctiva as a means of detecting early avitaminosis A.

When manifest ocular lesions of avitaminosis A were observed in a considerable number of persons in an adult group, the eye examination not only in the gross but also by biomicroscope was extended to the entire group. The principal manifestation was xerosis conjunctivae, often with mild xerosis corneae. The cases could be arranged in three main categories. In some there were gross ocular manifestations in the form of characteristic elevated spots, the so-called Bitot's spots, a feature of advanced xerosis conjunctivae. Others showed less pronounced but unmistakable gross conjunctival changes without a spot, but much more by biomicroscope. Finally, some exhibiting very little if anything grossly showed definite changes only by biomicroscope. The number of cases was sufficiently large to show all lesions as various stages in one process.

Following administration of vitamin A as specific therapy, the conjunctival lesions in nine persons have now completely disappeared, as judged by microscopic examination. In all others receiving therapy, the conjunctival lesions have markedly receded, in many to

[1] This paper is the fourth of a series from a cooperative investigation by the U. S. Public Health Service, National Institute of Health; the New York City Department of Health; the Cornell University Medical College, Department of Public Health and Preventive Medicine and Department of Pediatrics; and the Milbank Memorial Fund.

· The cooperating agencies have been assisted in carrying out this investigation by the Work Projects Administration for the City of New York, Official Project No. 65-1-97-21, W. P. 24, "Medical Evaluation of Nutritional Status."

the point of near disappearance. Those not receiving therapy have shown no improvement.

DESCRIPTION OF GROUP AND PROCEDURES

One hundred and sixty-six adults, 17 to 65 years of age, were examined for grossly elevated spots. Forty-five were white females; 7, colored females; 107, white males; and 7, colored males. The white individuals were from various racial stock. None regarded themselves as sick, and all attended work regularly. All except three received incomes ranging from $52 to $95 a month.

Their eyes were examined prior to therapy. Twenty-three persons permitted only gross examination, but are included in the total for calculation of the proportion of gross spot cases. The others were examined with the biomicroscope as well as in the gross. Both types of examination were limited to the area of the bulbus exposed upon extreme rotation in many directions. In addition, the inside of the lower lid of some individuals was examined grossly, but the upper lid was not everted.

Inasmuch as specific skin lesions have been reported as an early manifestation of avitaminosis A, the skin was examined in 47 persons prior to vitamin therapy, with all grades of severity of ocular lesions. Solely for convenience, the skin examination was restricted to males among those listed for therapy. A brief history of ocular symptoms was likewise taken from these same individuals.

For ascertaining the dietary requirements of vitamin A, dietary records were taken from a selected number representative of the various stages of the conjunctival lesion, as well as those not showing it. On most of the persons with lesions, adaptometer tests were conducted before, at various intervals during, and upon completion of therapy. The results on requirements and the correlation of conjunctival lesions with dark adaptation will appear in subsequent papers.

Because of the gravity of advanced conjunctival changes, all persons with fully developed, elevated Bitot's spots were offered, even urged, to take therapy. A few refused for various reasons; they thus formed a control group for the advanced cases with spots.

Of those individuals showing gross conjunctival changes without spots and those showing only microscopic changes, only a part received therapy. Cases were graded by severity into groups from which individuals to whom therapy was offered were selected at random so that 23 of 78 persons received therapy.

Therapy was instituted in one group on September 23 and in a second group on November 1, 1940, and consisted of 100,000 U. S. P. (International) units of pure vitamin A in four capsules of 25,000 units each during the day. For the most part, the therapy was taken in

the presence of the dispenser during the 5 work days, for over the week end a supply was given to be taken home. None of the individuals were advised of the nature of their ocular condition and its probable dietary basis; no change in diet was advised, in order that there would be no suggestion or encouragement to take other or additional supplements *ex cathedra*, or to modify dietary habits.

A very few among those receiving therapy, as well as those not receiving therapy, have since become unavailable through departure and could not be further followed. Through some whim, one or two stopped therapy. In all, 61 persons are still receiving vitamin A capsules; treatment has been discontinued on the 9 now completely restored. Eye examinations have been conducted at intervals on the groups receiving and not receiving treatment; for the former these examinations have formed the basis for terminating therapy.

OCULAR SIGNS AND LESIONS IN GROSS "SPOT" CASES

Of the 166 persons examined, 65 (39 percent) had one or more manifest spots.

For the most part, the manifest spot cases include the most advanced cases. By manifest spots is meant grossly perceptible elevated conjunctival spots of distinctive color and characteristic location. Since these patients exhibited different phases of the advanced stage, the observations, both gross and microscopic, are most lucidly and succinctly presented by a composite description.

Facing bright daylight but not sunlight, most "spot" cases showed definite photophobia and lacrimation most readily elicited, however, upon examination with the slit lamp. Almost all of these patients had previously been aware of these disturbances, but it is striking that so few had noticed the spots until called to their attention.

The caruncle and plica semilunaris were usually swollen and engorged. In many instances the eyelids were swollen. The inferior fornix conjunctivae showed looseness, additional folds, and some congestion.

The vascular network in the conjunctiva was conspicuous; vessels converged radially from the canthus and fornices toward the limbus. These are large, prominent, superficial vessels from which, by close inspection, numerous lesser branches may be seen to ramify and form a fine network. This vascular pattern is distinct; but what at first seems paradoxical, the vascular plexus appears less pronounced and extensive in the eyes with most severe conjunctival involvement. Often in these instances the large vessels seem to reach only half way to the limbus.

Generalized changes varying with severity occurred in the bulbar conjunctiva. In bold outline one part may be elevated in bandlike

form above the remaining conjunctiva. There is usually wrinkling or folds, frequently along the line of apposition of the bulbar with the upper margin of the lower palpebrum, although vertical crescentic folds are sometimes seen near the inner canthus. In detail the surface shows further unevenness because the conjunctiva is raised slightly over the vessels, leaving small, shallow depressions in honeycomb pattern within the vascular outlines.

In texture the conjunctival surface may be smooth or rough; invariably it has diminished luster. Its color may be creamy, ivory, white, greenish white, whitish green, or bluish milky, according to severity. Very frequently it is a yellowish orange, taupe, or gray brown with underlying whitish green, due to association with vascularization. In appropriate light the conjunctiva of the partially advanced cases showed opalescence; sometimes it was greenish yellow, sometimes amethyst, but most often it had a silvery or galena hue.

Moreover, in seven cases pigmentation was seen as sharply localized deposits or as a narrow rim following the boundary of the limbus. This occurred only in the colored individuals, never in the white.

Depending on the stage of severity, the conjunctiva showed changes in its transmission of light. In the most advanced cases it was opaque. The color of the choroid shining through the sclera, indeed most of the vascular network, was completely obscured. Where there was opalescence, the conjunctiva was usually translucent. Frequently the superficial strata of an elevated area appeared as a transparent film, much as if a sheet of cellophane were superimposed on an opaque conjunctiva. Less advanced cases showed various degrees of translucence or diminished transparency.

That the conjunctiva is thickened may be inferred from the following gross manifestations: The irregular surface with its bandlike elevations; the very great depth to which light penetrates in the opalescent cases; the thick superficial transparent film.

Uneven contour, diminished smoothness, lackluster, and wrinkling of the surface, opalescence, localized pigmentation, thickness, changed color, and decreased transmission of light all characterize manifest xerosis conjunctivae.

The large series of "spot" cases with lesions in various gradations of development presented many intermediate stages of xerosis up to fully developed. In one zone of an eye, the changes may occasionally, in advanced stages, be of a similar degree over the entire area, but for the most part they do not occur uniformly. Because of what appears to be predilection in the site of progression, there are various topical patterns of color, thickness, and transmissibility. Frequently in the nasal zone the conjunctival thickening and opacity is limited to the third adjacent to the canthus. At the equator this may converge to a band which runs to the limbus. Thus, in the less advanced cases,

the changes may be limited to a localized segment or band, but later they may extend over the entire zone with the band forming a superstructure. The most marked involvement is near both the canthus and limbus.

The Bitot's spot occurred as part of the same process of conjunctival change. It is a small localized area where the tissue change is most advanced. In the first classification of individuals the criterion was arbitrarily adopted that the area must be elevated above its surrounding tissue in order to be regarded as a Bitot's spot. Its more pronounced color and opacity, as well as its elevation, gives it a rather well-defined border and makes it grossly distinguishable from the remaining altered conjunctiva.

Almost always the spot was located at the junction of the equator and limbus. It was most frequently triangular with the base adjacent to the limbus; but other shapes, such as oval, occasionally occurred. Its surface contour was various; flat, undulatory, ridge, and dome forms occurred about equally. In color the spot was usually white, creamy, yellow, or orange, and almost always it was opaque. It varied in the extent to which it was elevated above the rest of the conjunctiva.

Among the large number of persons the spot was observed in various stages of formation; hence, the variability in size, elevation, and color. In general, the white spots were in the earlier stage of development, while the yellow or orange were in the advanced stage. Just as the spot occurred in various stages of development, it was associated with various stages of change in the rest of the conjunctiva, but the latter was always less advanced. In the spot cases there was no gross opacity in the cornea.

Considering both the entire conjunctival lesion and the spot jointly, the degree and extent of change were usually not the same in the two zones of the same eye. In 11 persons, one spot occurred; in 9 persons, three spots occurred. When two eyes were involved, each with one spot in corresponding zones, nasal lesions were more frequent than temporal. Where spots occurred in all four zones, the nasal lesions were usually more advanced than the temporal. Here the similar zones of the individual's two eyes, e. g., the nasal zones of both eyes, often but not invariably showed a like degree and extent of change. The distribution of cases according to number of spots was as follows: one spot, 11 persons; two spots, 31; three spots, 9; and four spots, 14.

Biomicroscopic examination.—Illumination of the eye with the slit lamp brings out clearly any photophobia and lacrimation.

Upon biomicroscopic examination the large superficial conjunctival vessels were seen to ramify into medium-sized vessels which in turn branched into fine vessels; these medium and fine branches of one vessel anastomosed among themselves and with those of another to

form the network. If the conjunctiva is translucent, the vessels can be seen at several levels. Furthermore, the superficial vessels anastomose with deep vessels at various points besides the limbus. The superficial network is more extensive than the deep network. If the conjunctiva is opaque, the several strata of the superficial vessels, as well as the deep vessels, are completely obscured. The greater the impenetrability of the conjunctiva to light, the less prominent the vascular network; thus, paradoxically, the more advanced stages of the process appear to have less vascular involvement. All the superficial vessels are dilated and engorged, even in the early stages; this accounts for their gross prominence. Such deep vessels as may be seen are usually likewise dilated and engorged.

In avitaminosis A the vascular reaction at the limbus, while somewhat similar in tendency to that in ariboflavinosis, shows distinct differences. In the "spot" cases the process instead of occurring all around the limbic circumference is limited to two arcs from 8 to 10 and 2 to 4 o'clock. There is no plexiform tiering; the arcades, failing proliferation, do not extend beyond one layer. This single tier of arcades is not continuous, for here and there anastomosis has failed so that there is an interrupted pattern. Thus it appears as a vascular serration with missing teeth. Furthermore, invasion of cornea by the capillaries was slight, negligible, or absent. Corneal opacity was relatively infrequent. This is not to say that in still more severe cases the vascular reaction at limbus might not be more pronounced. In present cases, however, it was less developed and extensive there than that seen in early ariboflavinosis. Although the avitaminosis A was in an advanced stage with its most pronounced conjunctival change adjacent to the limbus, the vascular reaction there was not of the same order. Unlike that in ariboflavinosis, it was most pronounced in the superficial vessels over the conjunctiva.

Besides the vascular reaction in the grossly elevated "spot" cases, the biomicroscope reveals details of changes seen grossly, as well as those not seen grossly. The topography of the conjunctiva (surface contour) is seen to have areas of localized elevation in the form of a band, spot, or both. Wrinkling, observed grossly, is especially prominent under the biomicroscope, and is located at the line of apposition of the superior border of the lower lid with the conjunctiva bulbi. Small conjunctival cysts when situated superficially may produce a bulge, but more often they are situated deeper. Localized pigment deposits as granules or powder may be seen in some cases.

It is convenient to consider the observations on thickness and light transmission in an entire zone, and then in the spot. When part of the conjunctiva is seen to be elevated, increased thickness is inferred. Elsewhere thickness may be determined through orientation with deep vessels. Where there are several layers of superficial

vessels and opacity obscures the deeper superficial as well as the deep vessels, this may be misleading. Then some of the superficial vessels are apt to be mistaken for the deep, and increased thickness may not be recognized. In almost all instances where a spot was present, there was increased thickness of the conjunctiva over most of that zone.

In the biomicroscopic examination of the conjunctiva it is possible to recognize with slit-lamp illumination three main degrees of transmission of light: transparency, translucency, and opacity. Since the conjunctiva was always examined under tension from rotation of the eye, any diminution of transmission was minimized rather than exaggerated. A transparent conjunctiva illuminated diffusely permitted the scleral landmarks and deep vessels to be seen distinctly. Under focal illumination the conjunctiva itself appeared as a moderate suspension of fine flakes in a clear medium. When translucence prevailed, by diffuse illumination the scleral landmarks and deep vessels were seen indistinctly as through frosted glass, or were almost completely obscured. By focal illumination the conjunctiva presented a uniformly dense suspension of opaque flakes in a turbid medium; with the gradations in translucence there was considerable variability in the size of the flakes, the turbidity of the medium, and the density of the suspension. With opacity the conjunctiva by diffuse illumination was impervious to light and deep vessels were not visible. Here focal illumination added little to recognition.

Transmission of light was frequently not uniform for the entire area of a zone. For example, on the equator at the midpoint there may be punctate opacities which under indirect illumination are shown to be isolated flocculent clumps. Nor was transmission always uniform throughout the depth of the conjunctiva. The superficial layers of the conjunctiva were often more transmissive than the deep. By diffuse illumination the larger deep vessels were palely outlined, as though frost-covered. Thus, the translucence appears to be mainly in the deep conjunctival layer, or, with the upper layer transparent or translucent, the deep vessels—and probably also the deeper rami of the superficial vessels—may be entirely obscured. Here the opacity is restricted to the deep layers with their surface having a cottony appearance.

Accordingly, in classifying the transmissiveness of the conjunctiva with reference to these two strata, the following categories were used: Tr Tl, Tl Tl, Tr O, Tl O, and O O. As may be readily recognized, Tr, Tl, and O are abbreviations for transparent, translucent, and opaque, respectively. The first character of the symbol for each category refers to the superficial conjunctival strata; the second character to the deep. It should be cautioned that where the deep conjunctival layers are less transmissive than the superficial—as in Tr Tl, Tr O,

or Tl O—an extensive superficial vascular network may be mistaken for the deep; increased conjunctival thickness may be overlooked, and an erroneous conclusion reached.

In a zone with a spot, all degrees of transmission were observed in the rest of the conjunctiva. As might be expected, when the spot is in the earliest stage of development, there is least change in the remaining area; when the spot is more fully developed, there is general zonal opacity.

The spot itself, as seen microscopically, shows changes more pronounced than elsewhere in the conjunctiva. Viewed by diffuse illumination, it may exhibit scattered dots of opacity; by either focal or indirect illumination these are seen to be due to isolated clumps of flocculent material. When farther advanced the opaque mass may comprise a dense coalescence of flakes with loose aggregates around its border. Developed still more, the spot may appear either gelatinous or horny.

In a few instances where gross examination revealed a spot characteristic in all respects except that it did not project above the adjacent surface, it was possible by microscope to confirm its identity and to determine whether it was at all elevated. Then, too, in some zones the microscope detected very early opaque spots which were not grossly perceptible. Actually, both these types are true spots in the very early stages, but they are not included in the foregoing data on the number of persons with spots or on the zonal distribution of spots.

INDIVIDUALS WITHOUT MANIFEST SPOTS

The conjunctivae of 78 individuals without manifest spots were also examined grossly and microscopically. Presenting many gradations, the observed changes extended over a wide range. Profound gross alterations were seen throughout some zones, never as advanced as in most severe "spot" cases but definitely more pronounced than in early "spot" cases. The most advanced showed extensively the characteristic color changes, lackluster, and opacity. Gross nonelevated spots were observed occasionally at the junction of the equator and limbus. Some persons exhibited only the characteristic superficial vascular network in the conjunctiva. On the whole, the "nonspot" group showed less intensively any of the characteristic conjunctival changes than did the manifest spot group. Indeed, in the mildest stage little or nothing may be seen grossly; the initial changes may be revealed definitely only by biomicroscopic examination.

In practice it was convenient to classify all the "nonspot" cases according to the severity and extent of involvement on the basis of microscopic findings. Severity was judged by the degree of light transmission with transparency, translucency, and opacity represent-

ing progressively advancing stages. Where transmission differed in the superficial and deep conjunctival layers, that in the latter was regarded as decisive. Classification into the three main groups was determined by the most severe state predominating in any one zone. Then subgrouping according to extent was based on the number of zones showing preponderantly the same condition.

Certain manifestations were noted in association with particular stages. Usually light transmission was in inverse proportion to the thickness of the conjunctiva. The vascular network, as seen microscopically, is least extensive and complex in pattern in the transparent conjunctiva. It appears to be more extensive and elaborate in translucent conjunctivae than in opaque. In opaque conjunctivae the network may seem to be as inconsiderable as in transparent conjunctivae. This is because the opacity obscures most of the network which in actuality is most extensive and elaborate.

In the 78 "nonspot" persons, the microscopic observations on light transmission through the conjunctivae revealed all stages over a broad range. Seventy-seven of them had diminished transmission in one or more zones. Thus, 99 percent of the "nonspot" group showed definite signs of avitaminosis A. Twelve persons showed only marked translucence in one or two zones. Judged by less strict criteria, which excludes these 12 persons, 65 (83 percent) of the "nonspot" group had marked translucence in three or four zones, or opacity in one or more zones.

Of the 143 persons examined with the biomicroscope, 45 percent had manifest spots (gross) and another 54 percent had distinct characteristic microscopic changes. By the method of classification which includes grouping of the "nonspot" cases according to the degree of light transmission, 45 percent of the persons had one or more spots, 31 percent had one or more opaque zones, and 23 percent had one or more markedly translucent zones as determined by microscopic examination. It should be noted that Bitot's spot is merely one stage in manifest xerosis conjunctivae. In some of the "nonspot" group, among a number of those presenting opaque zones upon microscopic examination, the xerosis was of such severity that it was also grossly perceptible.

CHANGES ON THERAPY

Upon administration of 100,000 I.U. vitamin A daily to both "spot" and "nonspot" cases, regardless of severity, the initial changes detectible by microscope were the same. There was diminution of engorgement in the superficial network with vessels still dilated. The circulatory stream did not fill the vessel and its flow was slow; then there was granular circulation followed by beaded or empty

vessels. The latter were seen as shadow vessels. With this retardation in flow or disappearance of the stream, the vessels diminished in size. In most instances these vascular changes took place first in that half of the conjunctiva which borders on the cornea. Soon thereafter the entire conjunctiva, which may have been translucent or opaque, became gradually thinner and more transparent. With diminution in thickness of the conjunctiva, cysts and superficial wrinkling are not infrequently seen as transient manifestations. The clearing in the medium advances while recessive changes in vessels are continuing, yet vessels may seem more numerous because many previously obscured by opaque medium now become visible. Gradually the spot diminishes in size, becomes perceptible as an opacity only by microscope, and finally disappears. If the treatment is complete, the conjunctiva becomes smooth, thin, lustrous, much less vascularized, and highly transparent or very slightly translucent.

In persons with gross lesions, several weeks after beginning repair had been followed by microscopic examination, signs could also be recognized by simple inspection. Perhaps the earliest improvement grossly perceptible was in lessened photophobia and lacrimation. Later it was noted that the conjunctiva had changed from opaque white to translucently bluish, at first slight and only in a small area, then gradually increasing in extent and completeness. The decreasing thickness and increasing clarity of the conjunctiva permit the choroid shining through the sclera to be seen. For a time Bitot's spot may appear more prominent because its borders are more sharply outlined and its opacity is cast into sharper contrast by the clearing in the adjacent, somewhat less severely affected conjunctiva. Gradually the spot diminishes in size and disappears. The swelling in the caruncle and lids recedes. Finally, upon complete recovery, the conjunctiva has a bluish-milk shade and has taken on a noticeable luster and sparkle which enliven the eyes and impart an animated expression to the face.

It should be noted that the criteria of complete recovery are rigorous since they are based on microscopic observations: slight translucency and thinness of the conjunctiva with inactivity in or absence of an excess vascularity. After receiving therapy for 8 months, one person with spots has been completely restored and discharged. In all others with spots, the conjunctiva has become less vascular, thinner, clearer, and more lustrous. The spots are much diminished in size, in many no longer grossly elevated, in some detectible only by microscope. Of the persons with "nonspot" lesions, eight have been fully restored and discharged. Naturally, since the "nonspot" lesions are usually less severe, more in this group were among the first to show

complete recovery. Nevertheless, they have required not less than 6 months' intensive therapy.

In both groups those who have not received therapy have shown no improvement.

Following the full recovery of those still receiving therapy, there will be a more complete report.

The results of the adaptometer tests, under rigid conditions of test and with specially calibrated instruments, will be published soon in a preliminary report. At this time it may be said that only a few very high values were found in the total range for the entire group. Not all persons with most advanced xerosis showed high levels, nor were high levels restricted to those with most pronounced xerosis.

DISCUSSION

The ocular manifestations of avitaminosis A are xerosis conjunctiva, including Bitot's spot, and xerosis corneae with subsequent corneal turbidity, ulcer, and keratomalacia. There is a very extensive bibliography dating back over 100 years on the nomenclature, etiology, and pathogenesis of the conjunctival and corneal changes, as well as their interrelation, but its presentation will be reserved for a later paper. Yet it is worth while to mention here that all these manifestations in the order enumerated are regarded as successive stages of one process.

Since the present study pertains only to the initial stages, it is appropriate to cite briefly some of the original observations on the conjunctival lesions. Although the first description is usually attributed to Bitot (*4*) in 1863, Cohn (*5*) cites 60 prior references to the condition dating back to 1803.

During this time it was known by various names. Some of these, such as xerophthalmos (*6*), xeroma (*7*), conjunctiva arida (*8*), and dry conjunctiva (*9*), expressed the dryness so often present in the pronounced stage.

Several authors preferred to stress the primary nature of the lesion. Accordingly, from its histogenic character, they denoted it under the descriptive names of cuticular conjunctiva (*10*), Ueberhautung der Conjunctiva (*11*), Hautbildung der Bindehaut (*12*), skinning over the conjunctiva (*9*). These terms are highly expressive of its histogenic nature and gross appearance, what is today called the metaplastic character of the epithelium.

Then von Ammon (*13*), more concerned with differentiating its etiological independence of an inflammatory process than in denoting its essential character, proposed the name of xerosis conjunctivae. In a footnote, he explained: "Xerosis (ἡ ξηρωσις), das Trocknen, Austrocknen. Der Herausgeber hofft, dass dieser Name durch die Beschreibung und Charakterisirung der Krankheit sich rechtfertigen

wird. Er hat die bekannteren Wörter, Xerophthalmos oder Xeromma (v. ξηρος und ὄμμα), deshalb nicht gewählt, weil die Grichen, da, wo sie dieses Wort gebrauchen, hiermit die in Folge der Entzündung der Bindehaut oder anderer Theile des Auges entstehende Trockenheit dieses Organs bezeichneten." But the choice was not fortunate inasmuch as it was still vague and misleading.

Later Bitot (*4*) described the conjunctival lesions as epithelial strata or plaques assuming various shapes, but he gave them no name. Subsequent to his publication, several of his contemporaries referred to them as Bitot's spots, a name which has since gained some currency.

At the present time there is no satisfactory nomenclature expressing the true nature of the lesion. Unfortunately, it still retains the designations xerophthalmia and xerosis conjunctivae which are open to misconception because dryness is not its primary or most significant characteristic and is recognizable only in pronounced cases. Moreover, xerophthalmia is not specific for the conjunctival stage since it includes xerosis corneae as well as xerosis conjunctivae.

To some extent Bitot's spots are mentioned in the literature, but such an eponymic designation is not to be recommended. Besides, it applies only to a very particular stage of the conjunctival lesion. Of the three terms still in vogue, xerosis conjunctivae is perhaps the least objectionable to denote the conjunctival lesion, but it should carry a connotation of the fundamental nature of the lesion.

Xerosis conjunctiva, and the more advanced stage xerosis corneae, were reported in association with a series of diseases and were attributed to numerous causes. Within 2 years of Bitot's observation, Gama Lobo (*14*) asserted that xerosis occurring in Brazilian slaves resulted from lack of suitable and sufficient food. In the next year Blessig (*15*) noted that the xerosis appeared preponderantly during the 7-week Lenten fast and receded thereafter. He insisted that it was the consequence of a nutritional disturbance which was not simple inanition, and suggested lack of nitrogenous substances. Calling attention to the severe disturbance of the general nutritive condition so frequently observed with the eye lesions, Förster (*16*) in 1877 inclined to the view that "nutritive deficiency" was responsible for the ocular changes, comparable to such trophic disturbances as decubitus and diabetic gangrene. Shortly thereafter de Gouvêa (*17*) declared that xerophthalmia is a natural consequence of the general nutritional disturbance caused by chronic progressive anemia which resulted in part from heavy labor and an insufficient and deficient diet. In the same year Thalberg (*18*) reported the occurrence of keratomalacia in infants nursed by mothers who gave sufficient milk but were anemic or debilitated by prolonged fasting. Likewise, Schoeler (*19*) in 1887 observed the ocular lesions in adults who were on restricted or unbalanced diets.

From 1866 to 1904, 12 reports appeared on the successful use of liver or cod-liver oil internally for xerophthalmia (*20*). In treating more than 1,500 infants with xerosis conjunctivae, Mori (1904) (*21*) found immediate and specific response to cod-liver oil. Since their diets contained little fat, and they responded to liver oil, he attributed the ocular lesions to inadequate fat. He advanced this hypothesis despite his lack of success with sesame or olive oil.

In 1906 Falta and Noeggerath (*22*), feeding rats on a "purified" diet, noted the development of a conjunctivitis in the course of their general nutritive decline. Reproducing these results in a further investigation of this possible relationship between the conjunctival disease and diet, Knapp (*23*) in 1909 drew the interesting conclusion that the eye disorder was due to a specific dietary deficiency of an unknown substance. Then came McCollum and Davis' (*24*) demonstration that growth was not possible in rats restricted to a standard ration unless a substance contained only in certain fats (fat-soluble A) was included. Shortly, Osborne and Mendel (*25, 26*) pointed out that inflamed and purulent eyes appeared in animals on diets deficient in the fat-soluble vitamin, one source being cod-liver oil, and disappeared upon administration of it.

Whereas the preceding observations revealed a deficiency of fat-soluble A as the cause of an eye disease but did not identify the latter with xerophthalmia, other investigations showed that the ocular disease induced experimentally by a deficient diet was really xerophthalmia, but did not recognize and identify the missing dietary factor as fat-soluble A. Using a diet complete in calories and known constituents but deficient, as they knew, in certain other unidentified indispensable substances, Freise, Goldschmidt, and Frank (*27, 28*) asserted that they had experimentally produced keratomalacia. They placed it among the deficiency diseases, but their experiments did not permit them to characterize the deficiency.

Impressed by the low fat content in the diets of his xerophthalmic patients and the striking efficacy of cod-liver oil in an epidemic in Denmark during World War I, Bloch (*29*), though cognizant of McCollum's results, subscribed to Mori's theory of fat deficiency as the cause of the eye disorder. McCollum and Simmonds (*30*) thereupon enunciated the view that xerophthalmia in human beings and in rats was analogous, representing a deficiency in vitamin A. They said: "We feel confident that these cases of xerophthalmia reported by Mori and Bloch should be looked upon as a 'deficiency disease' not hitherto recognized in its true relation to diet. It is not, as these authors believe, a 'fat starvation' which produced the condition, but a lack of the unidentified dietary factor, fat-soluble A, which occurs in just those foodstuffs which they observed to possess curative properties."

Night blindness is another ocular manifestation reported as appearing in avitaminosis A. Literally it is failure or imperfection of vision at night or in dim light. There is an older and more extensive recorded history for night blindness than for xerosis. Among the views on its etiology, the nutritional was based on dietary inquiries or observations on effective therapeutic agents.

In old Chinese medicine, chicken or sheep liver was highly recommended as a specific for night blindness; and among the home remedies, chicken-liver extract in honey was popular (*31, 32*). In 1859 Graefe (*33*) designated insufficient and poor food as a contributory factor in its causation. Following Bitot's contention that xerosis and night blindness were associated as parts of the same process, it might be expected that both would be attributed to the same cause and that therapy found effective for one would be used for the other. But, in the main, developments in views on their cause did not proceed in parallel.

Some of the early investigators who put forward the hypothesis of a nutritional etiology of xerosis did not mention any associated night blindness, nor even suggest that the same cause might be responsible for both (*16, 18, 19*). On the other hand, several of their contemporaries reporting that night blindness appeared under conditions of poor nutrition, as in prisons (*34, 35*) and after long fasts (*36*), presented it as an independent entity. From 1863 to 1910 there appeared a series of reports on the beneficial effects of cod-liver oil or liver for night blindness; in one or two xerosis was mentioned but with skepticism or uncertainty over any relationship to night blindness; in most, xerosis was not mentioned; in some, scurvy was cited as a significant associated manifestation (*37, 20*). Epidemic night blindness was stated by a few to be a consequence of faulty diet, particularly an imbalance (*37*); one specified fat deficiency (*38*).

It is true that Blessig (*15*) in 1866 charged both xerosis and night blindness to a nutritional disturbance occasioned perhaps by a deficiency of nitrogenous substances. Krienes (*37*) in 1896 attributed concurrent essential night blindness and xerosis to the same causes, of which one was nutritional disturbance. Groenouw (*39*) in 1904 mentioned the simultaneous occurrence of the two signs on long voyages where the diet was unsatisfactory. Furthermore, de Gouvêa (*17*) in 1883 and Mori (*21*) in 1904 reported that both conditions responded to cod-liver oil. Accordingly they stated that the two manifestations had a common cause; the former suggested improper and insufficient food; the latter specified a fat deficiency. These were clear exceptions to the trend to consider night blindness apart from xerosis.

Even during the period from 1913 to 1917 when vitamin A was discovered, when the occurrence of xerophthalmia in A-deficient

animals was observed, and when xerosis in persons was found to be a manifestation of avitaminosis A, any relationship of night blindness to these developments was not at once demonstrated. Perhaps the reason lies in the course of events peculiar to night blindness. Very early it was reported as occurring alone and also in association with numerous diseases. In classifying its appearance under many circumstances the earliest distinction was between idiopathic or epidemic and symptomatic. In 1881 Parinaud (*40*) suggested that night blindness is dependent on a disturbance of the visual purple in the retina. Treitel (*41*) in 1885 concluded that it is characterized essentially by a disturbance in dark adaptation. In turn, this was attributed to involvement of the visual purple in the rods.

With the development of several instruments, dysadaptation was found to result from many circumstances; and all the while the classifications of night blindness increased in number and kind. Commenting on the unsuccessful attempts to unify the concepts of night blindness, Birch-Hirschfeld (*42*) summed up the status in 1917: "The chief difficulty in explaining the nature of night blindness rests on the fact that we are dealing with a symptom rather than a uniform disease produced by a particular etiology." He presented a classification based on 11 causes, each with a different mechanism affecting visual purple. Thus it came to be believed that there were several kinds of night blindness. Acute epidemic or essential night blindness was regarded as due to dietary deficiency. During World War I, however, there were epidemics attributed to nondietary factors. Furthermore, it was pointed out that night blindness and dysadaptation were not synonymous, that disturbance in the transmissive mechanism, apart from the receptive tissue, could bring about night blindness by preventing effective operation of the visual purple.

In 1915 Wietfeldt (*43*) suggested that essential or epidemic night blindness might be due to a lack of vitamins. Upon curing this form with carrot juice or liver, Zak (*44*) in 1917 stated that it was a manifestation of avitaminosis, although his studies did not permit him to decide whether it was an independent disease or a symptom of scurvy. Hift (*45*) laid great emphasis on the concurrence of night blindness and scurvy. At the same time Birch-Hirschfeld (*42*) likewise specified vitamin deficiency as one of the primary influences in the pathogenesis of night blindness, citing scurvy, beriberi, and keratomalacia as examples without identifying the relation of night blindness. In 1923 Popovitch (*46*) suggested that it resulted from a deficiency in the fat-soluble vitamin since therapeutically active substances were rich in it. By testing the ability of rats to jump off a table in a dim light, after previous exposure to bright sunlight, Holm (*47*) demonstrated that vitamin A deficient rats had developed a well-defined night blindness. The administration of vitamin A to them resulted in a

disappearance of symptoms. At the same time Fridericia and Holm (*48*) reported that vitamin A deficient rats placed in the dark after exposure to light showed a retarded regeneration of visual purple. Thus one form of night blindness, with dysadaptation due to impaired regeneration of visual purple, was linked with avitaminosis A.

Very largely on the basis of the latter studies (*47*, *48*), night blindness came to be regarded also as the earliest sign of avitaminosis A. Of the delay in regeneration of visual purple, Fridericia and Holm said: "This symptom is an early one, being manifested as soon as the growth of the young rat stops and earlier than the onset of pronounced xerophthalmic symptoms." Even more emphatic was Holm: "The hemeralopia in the experimental-rats could be detected soon after the alimentation on food without fat-soluble-A had begun, * * * *at a stage where it was impossible to perceive any other sure signs of avitaminosis* except a slight failure to increase normally in weight."

This view that night blindness is the earliest sign of avitaminosis A gained ready acceptance in clinical medicine. In a textbook (*49*) on the clinical manifestations of avitaminoses, it is said: "* * * bilden sie eine besondere Trias, die allerdings beim gleichen Individuum nicht immer gleichzeitig, sondern meist in einer bestimmten zeitlichen Reihenfolge: Hemeralopie-Xerophthalmie-Keratomalacie, angetroffen wird." Several reasons probably contributed to this acceptance. Although originally the simultaneous presence of two or all three of the signs in the same person finally came to be noted there was no common agreement at that time on the sequence of events. Subsequently knowledge concerning night blindness developed separately. Within the past 25 years there have been numerous recorded epidemics of night blindness. In that time there have been few or no reports on any high incidences of xerosis conjunctivae, although there have been recorded outbreaks of xerosis corneae and keratomalacia in which xerosis conjunctivae alone, as the initial change, must certainly have been present earlier. Emphasis, however, was placed on the more severe stage, keratomalacia; indeed xerophthalmia more and more came to connote more strictly the corneal stage. As an advanced stage, its subsequence to night blindness was not questioned. Furthermore, night blindness was detected because of patient's complaint; but in xerosis conjunctivae, since visual acuity is not markedly affected, the patients are usually not concerned over the symptoms until inquiry directs attention to them.

When night blindness was said to be the earliest sign, it came to mean that it is a manifestation of mild avitaminosis A, either too short in duration or insufficiently severe in degree to produce xerophthalmia (*50*). This view gave fresh impetus to tests for dark adaptation as a means of detecting avitaminosis A, particularly the subclinical stage. With technical improvements it became possible to measure

small deviations in dark adaptation. Since manifest night blindness was regarded as the earliest ocular sign of avitaminosis A, these small changes were understandably interpreted as a still earlier stage of the disturbance. All this has strengthened the notion that night blindness, or dysadaptation, is the earliest change.

Nevertheless, when the entire record of events is carefully consulted, it is proper to raise three questions: Is night blindness a specific manifestation of avitaminosis A? Can night blindness result from vitamin A deficiency alone? Is night blindness the earliest sign of avitaminosis A? Each has a bearing on the usefulness of the adaptometer as a means of detecting subclinical avitaminosis A. The first two questions, however, may be considered jointly.

By almost every investigator of epidemic night blindness, from the very earliest to the more recent, its onset has been attributed to overexposure to bright light (*4, 17, 33, 35–40, 42, 47, 48*). Its occurrence predominantly among workers exposed to the sunlight for long hours, day after day, as in the fields and at sea, was at once suggestive and convincing. In accord with it were the observations that night-blind patients experienced no difficulty in seeing in early morning although it was much darker than in the evening (*17, 48*). Throughout the course of expanding and shifting views on the etiology of night blindness, investigators continued to lay stress on light; most of them designated it as the determining or precipitating influence. Deficient diet was regarded until recently only as a contributory factor. Other evidence added support to the view that light was a significant influence. For many years the standard treatment for night blindness was confinement in a dark room for 48 hours, or the use of dark glasses. The prompt efficacy of this treatment gave substance to the views about the influence of light in the causation of night blindness.

On the experimental side, it should be recalled that Fridericia and Holm succeeded in inducing night blindness and dysadaptation in vitamin A deficient rats only after exposing them to intense sunlight for several hours daily over a period of several weeks and then to artificial light for 20 minutes prior to the test (*47, 48*). Holm declared (*47*): "Hemeralopia does not develop through lack of fat-soluble-A-vitamin alone; *it is necessary also that the individuals be much exposed to light.*" It may well be that actinic rays have an aggravating effect on avitaminosis A; it should be borne in mind that such a reaction has been noted in ariboflavinosis and pellagra. In any event, all these observations are pertinent to any consideration of the prevalent view that vitamin A deficiency alone produces night blindness as a specific manifestation. They also raise the question whether the present procedure in the tests for dysadaptation would permit detection of it in the subclinical stage.

The place of night blindness in the sequence of ocular manifestations is a matter fundamental to the early detection of avitaminosis A. When all circumstances are taken into account, it is quite possible that night blindness may not be the earliest ocular change. Reexamination of the very early records brings out the uncertainty in the matter and at the same time indicates the advisability of giving fuller consideration to xerosis conjunctivae. It is well to recall that 100 years ago clinicians seeking signs for early detection of the syndrome debated this very question of whether night blindness or xerosis conjunctivae is earlier. There was marked divergence of opinion, but the evidence supported equally well, if not preponderantly, the priority of xerosis. For one thing, in Bitot's series of cases, the conjunctival spots occurred without night blindness. Besides, in some cases night blindness appeared only after the xerosis was far advanced. Bitot regarded xerosis as the herald of night blindness.

Although the recorded epidemics of night blindness in which xerosis was not mentioned have doubtless favored acceptance of night blindness as the earliest manifestation of avitaminosis A, the view really hinges on the animal experiments of Fridericia and Holm (*47*, *48*). It should be noted that when they stated (*48*) that dysadaptation preceded pronounced xerophthalmic symptoms, they meant that dysadaptation preceded corneal involvement, which is an advanced or late stage. Furthermore, when Holm (*47*) stated that night blindness developed in the rats before any perceptible signs of avitaminosis except retardation in growth, he was judging by three signs not recorded for man: enophthalmus, loss of ciliary hair, and a peculiar lacrimal secretion. He did not mention looking for xerotic changes in the conjunctivae other than to state that because of physical conditions it is impossible to produce Bitot's spots in rats. Certainly on the basis of neither study can it be said that night blindness precedes xerosis conjunctivae. In fact, the observations, both clinical and experimental, would seem to cast some doubt on the validity of the prevalent view that night blindness is the first ocular sign of avitaminosis A.

Present-day work does not dispel this doubt. In studies on adaptation with sensitive equipment, often the validity of the data on avitaminosis A has not been supported by therapeutic evidence. In other instances it has been shown that small differences supposedly representing improvement from vitamin A therapy were probably learning responses or instrumental artefacts (*51*, *52*, *53*).

This background would seem to warrant reopening the question of whether xerosis or night blindness is the earlier manifestation. While the old observations serve to revive the issue, they cannot settle it. Then both conditions were diagnosed only in their advanced stages and in a way—xerosis by gross examination and night blindness by

history—which is inconclusive on the point of priority. For this it is necessary to have observations with sensitive instruments on early dysadaptation and xerosis, noting their concurrence or order of appearance. With the calibrated adaptometer and the biomicroscope, this became possible. In the present study dysadaptation did not precede the xerosis conjunctivae. Indeed, dysadaptation was not specifically correlated with the degree of conjunctival change.

It is generally accepted that characteristic lesions in the eye are not the only changes in avitaminosis A, nor are they regarded as the first. However, the intimation that skin lesions, under such varied names as follicular hyperkeratosis, phrynoderma, and xeroderma, represent the initial manifestation (*54*) finds no support from histopathological studies on experimental animals. In the "spot" cases of the present study, only occasionally were possible dermal lesions noted; then they were so indefinite as to be questionable. None were seen in persons with less severe eye lesions. In the entire series, therefore, gross cutaneous did not precede ocular changes.

In suggesting biomicroscopic examination of the eye as a means of detecting early avitaminosis A, it is not meant to imply that the ocular lesion is the sole, the first, or the most important change. Xerophthalmia is not synonymous with avitaminosis A. Histopathological examinations on both humans and animals have shown that avitaminosis A is characterized by widespread epithelial changes throughout the body, for example, the respiratory, paraocular, and renal, as well as the ocular organs (*55*, *56*, *57*). Wolbach and Howe (*56*) have stated that xerophthalmia is not the earliest manifestation of avitaminosis A in the rat. For human beings there is very little evidence on what is the initial site and the sequence of sites undergoing change.

Nevertheless, among the organs showing early change, the eyes are a favorable site for detecting vitamin A involvement, for they are accessible to observation or test. There is another point of advantage: the initial lesion in the eye occurs in the conjunctiva. Inspection for gross changes, including Bitot's spots, may be used in screening advanced cases, which may be subgrouped, if desired, according to the number of zones affected. Biomicroscopic examination detects subgross changes of all gradations which may be classified according to severity and extent. Hence, by combined gross and microscopic examinations, it is possible to determine all stages of xerosis and thus to grade the avitaminosis A.

Especially does the biomicroscopic examination of the bulbar surface present several additional advantages: (1) it shows the early changes in the conjunctiva—site of the initial ocular lesion in avitaminosis A—that are not visible grossly; (2) it is a rapid, convenient, and objective method for detecting the very early avitaminosis A;

(3) it permits a simultaneous examination of the limbus and cornea for early ariboflavinosis, from which avitaminosis A is easily differentiated; (4) it provides a much-needed means for ascertaining the dietary requirements for both vitamin A and riboflavin.

In the present study, the examination of conjunctivae both grossly and biomicroscopically shows a high prevalence of avitaminosis A in this low-income group. It is so high as to seem at first glance almost incredible, but it is substantiated on several grounds.

In reporting on a national dietary survey Stiebeling and Phipard stated (*58*): "Taking 6,000 International Units per day as the allowance for the adult man, * * * it is estimated that the lowest 25 per cent of the diets [for all of the white families represented by the study] furnished 2,000 or less International Units a requirement unit a day, and the lowest 75 per cent, less than 4,500 International Units a day." In the cities of the North Atlantic region, including New York City, they found that in the group with a weekly per capita expenditure for food between $1.25 and $1.87, 67 percent had less than 2,000 International Units, 20 percent had between 2,000 and 3,999 Units, and 9 percent between 4,000 and 5,999 Units. At least 90 percent were thus receiving less than the estimated required amount of vitamin A. In the present study, the prevalence of avitaminosis A in the comparably low income group was more than 90 percent.[2] These figures strikingly bear out the dietary data while the latter, in turn, account for the high prevalence, suggesting that dietary deficiency was largely responsible.

In addition, it is not at all unlikely that in some instances other factors contributed to the prevalence. For example, it is conceivable that certain acute illnesses disturbing the vitamin A economy may have brought on the avitaminosis or accentuated existing lesions so that in convalescence even an abundant amount of the essential in the diet would not be sufficient for rapid restoration. With a slightly inferior diet, recovery would not be complete for an indefinite period.

Furthermore, with manifest conjunctival lesions in 45 percent of the persons, a sizable number with less pronounced changes visible only with the biomicroscope would be expected. But above all, the response of the affected persons to the specific therapy attests to the actuality of avitaminosis A in so large a proportion of the group.

Upon administration of therapy, recession is similar in type to that in ariboflavinosis: obliteration of vessels and dissipation of opacities. The striking feature, however, is the very long period required for complete recovery, a matter of months even with therapy of high

[2] A lower prevalence would be expected in higher income groups. Upon examination of 25 adults in a medium income group, 16 showed definite conjunctival changes. Five persons in the group had gross spots. It is more than likely that avitaminosis A is one of the more commonly occurring deficiency diseases and is present in a considerable proportion of the population.

potency. This is reasonable considering that when the eyes show such profound change, many epithelial structures throughout the body are known to be simultaneously affected. Restoration of all this epithelium takes time.

These results indicate that complete recovery from this deficiency disease is not so rapid as is popularly reported. This protracted recovery, even with high dosage of vitamin A, also casts a significant light on therapeutic practice in avitaminoses. Currently it is often asserted that adequate diet corrects deficiency diseases. In a sense this is true if time is no consideration. But if therapy of high potency brings about complete recovery only after an extended period, an optimum diet might be expected to require a very much longer time. It seems necessary to take the view that persons affected with deficiency diseases need intensive specific therapy for most rapid recovery. Obviously, an optimum diet should be instituted for its supplementary nutritive value, its protection against outbreak of other deficiencies, and for establishment of satisfactory dietary practice by the patient. Then when therapy is withdrawn upon recovery, the satisfactory dietary habits suffice for maintenance.

The use here of 100,000 I. U. of vitamin A daily is not to be construed as a recommendation or precedent that this amount is necessary for maximum rapid therapeutic results. In the present study it was essential to administer an amount that would ensure maximum response. It is certain that tissues have critical rates of response and that doses in excess of the amounts satisfying those rates have no further effect. It is common experience that effective therapeutic dosage for an avitaminosis is at least five to six times the maintenance requirement. Actually, therefore, it may be that daily levels of vitamin A between 25,000 and 50,000 I. U., for example, will be found sufficient to produce maximum therapeutic response. That is to be determined.

SUMMARY

Of 143 persons in a low income group, 45 percent had gross and another 54 percent had microscopic ocular lesions characteristic of avitaminosis A. The ocular condition was xerosis conjunctivae.

Following administration of vitamin A as specific therapy to a part of the group, the conjunctival lesions in nine persons have now completely disappeared, as judged in all instances by biomicroscopic examination. In all others receiving therapy, the conjunctival lesions have markedly receded to the point of near disappearance.

In all cases the striking feature is the very long period of time required for complete recovery, a matter of months even with therapy of high potency.

Those persons not receiving therapy have shown no improvement.

It is suggested that xerosis probably precedes night blindness as an early sign of avitaminosis A.

For detection of early avitaminosis A in surveys, the biomicroscopic examination is recommended as a simple, convenient, objective method. When it is combined with gross examination, all degrees of xerosis may be graded according to severity and extent.

The marked prevalence of avitaminosis A in this low income group, objectifying and validating previous dietary data, suggests its relatively frequent occurrence in the population at large.

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REGIONAL, RACIAL, AND FAMILIAL RELATIONSHIPS IN LEPROSY IN THE UNITED STATES[1]

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In the first half of the nineteenth century, when no one of the factors in the causation of infectious disease was given preference

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[1] From the Department of Preventive Medicine and Epidemiology, Harvard University, Boston, Mass. Financed by the Harvard Infantile Paralysis Commission and a grant from the Commonwealth Fund.

over others, remote circumstances were freely included with contagion. Thus, Joseph Gallup wrote of certain epidemic infections in 1815, "If diseases of this class are propagated by a contagious principle, it is of a singular sort, not subject to the laws of any known contagion." And he "assigned their origin * * * more to remote influences affecting the system which increase liability to disease."

With the development of the science of bacteriology, emphasis turned toward the immediate circumstance of exposure to the infectious agent as the more important determinant in the occurrence of disease, and the mode of spread became the central idea in epidemiology. But, with increasing knowledge of such phenomena as latent and subclinical infection and healthy carriers, many instances are now seen where the patterns of virus dissemination and disease distribution do not coincide. More or less remote factors are again recognized as important determinants in the limited or selective occurrence of disease in those exposed to the infectious agent.

Concepts in leprosy have followed these changing trends in thought in the epidemiology of infectious diseases. The doctrine of hereditary transmission, promulgated by Danielssen and Boeck, prevailed from 1848 until the discovery of the Hansen bacillus in 1874. The viewpoint of the contagionists then came to the forefront and has remained predominant, the failure of the disease to follow ordinary lines of contagion being attributed to supposed variations in the degree or duration of exposure to the infectious agent. For example, the well-known familial tendency of the disease has been ascribed to "prolonged and intimate exposure." But, with the recognition of the tendency of leprosy to remain restricted to certain regions, races, and families for long periods of time, beyond anything which could be explained by corresponding restrictions in exposure, doubt has been thrown upon the belief that contagion is the major determinant in the distribution of the disease, and the role of more remote influences is again being considered.

Hereditary susceptibility, a factor which has long been believed to be concerned in the occurrence of leprosy in those exposed, has been the subject of previous communications in connection with certain foci of the disease on the North American continent (*1*, *2*). This paper presents a study of certain regional, racial, and familial relationships of leprosy throughout the United States with similar implications. The data [2] comprise information concerning 927 admissions to the U. S. Marine Hospital, Carville, La., during the 18-year period from February 1921 (when the Louisiana Leper Home was acquired by the Federal Government) to December 18, 1939, including the place and date of birth of the patient, race, and sex, and place

[2] Data kindly furnished by Dr. H. E. Hasseltine, Medical Director, U. S. Marine Hospital, Carville, La.

and date of admission. Since names of patients are not available, this study is restricted so far as familial occurrence is concerned.

Admission to the hospital rests upon State regulations, and, although these differ in the various States, it would seem likely that the general consensus in regard to segregation is such that the number of patients at Carville is probably a fair index of the distribution of the disease in the United States (although estimates give varying proportions, down to one-half of those that actually exist).

LEPROSY IN FOREIGN-BORN PERSONS

The 430 foreign-born leprosy patients have been recorded as of the State from which they were admitted. Such an allocation, it is realized, may not be a complete representation of case distribution, since it is probable that a considerable period elapsed between the development of the disease and admission, during which time many of these immigrants doubtless moved from place to place, but it is enough to show that cases of leprosy have been introduced into many parts of the United States, and in greater numbers at certain points of immigration (fig. 1).

The more important racial and geographic groupings within the United States of the foreign-born patients are shown in table 1. That they represent largely importations is indicated by the fact that they come mostly from countries where the disease is known to be prevalent.

TABLE 1.—*Regional and racial distribution of foreign-born leprosy patients in the United States*

State from which admitted	Country of birth															
	Mexico	West Indies	Philippines	China	Greece	Hawaii	Italy	Russia	Spain	Portugal	Germany	Canada	Finland	Norway	Other	Total
Arizona	4															4
California	60	4	35	17	3	12		1	3	2					14	151
Colorado	6															6
Florida		9							1							10
Illinois	8	1	3	2				1							2	17
Louisiana	2						4	1				1			1	9
Massachusetts		2	1	1	3		3	1		3					6	20
Michigan	4			2	2		1								8	12
Minnesota			1		1							1	2	1		6
Missouri	1			1	1				1						2	6
New Jersey		3			1					1					1	6
New York	1	35	4	9	8	3	6	6	2	1	1	2		1	21	100
Oregon			1	1	1	1										4
Pennsylvania			1				1	1	1						2	6
Texas	38						1								1	40
Virginia		2	1												1	4
Washington			7											1		8
Wisconsin					1						1					2
Other States	5	1	2	1	3	1	1	1	2		1		1			19
Total	129	57	56	34	24	17	17	12	10	7	3	4	3	3	54	430

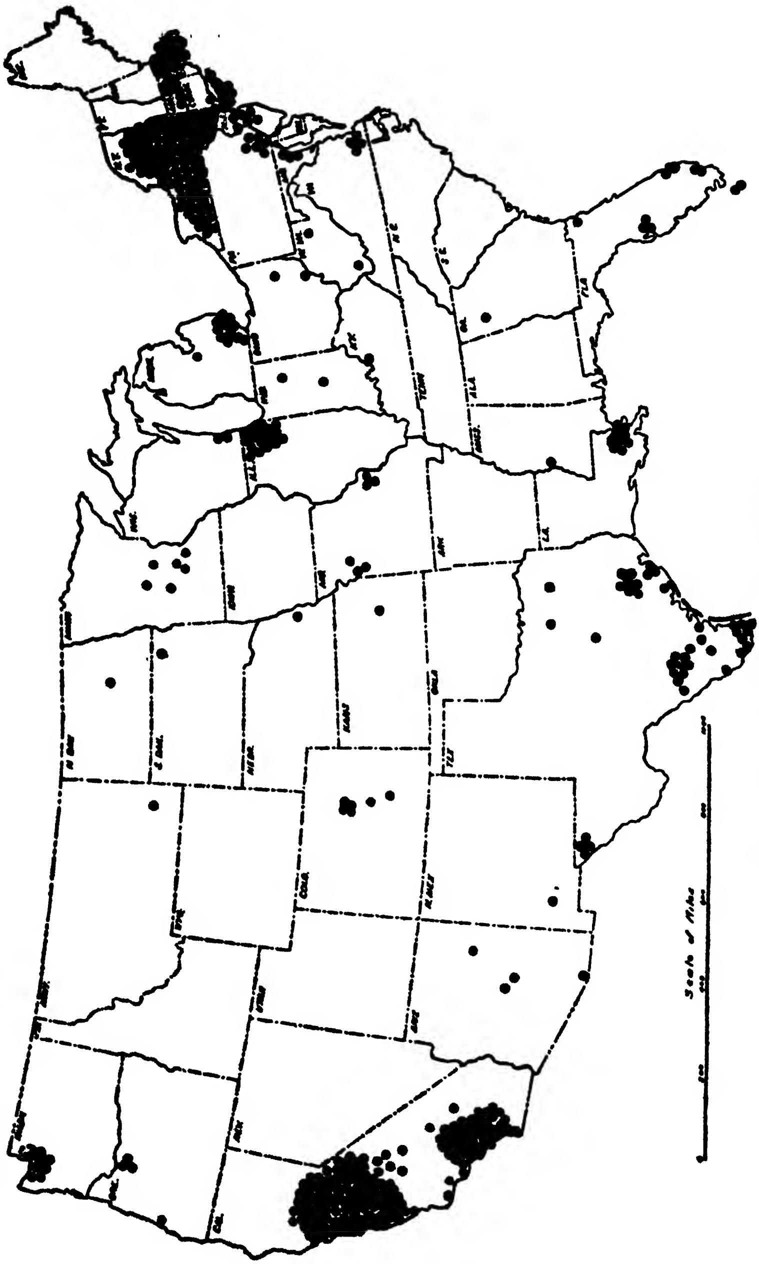

FIGURE 1.—Foreign-born cases of leprosy, by place of admission.

Furthermore, their geographic distribution by nativity in this country is in accordance with immigratory expectancy. Cases of leprosy in the foreign-born population of this country would thus appear to be attributable to the more remote circumstance of origin in a foreign leprous area, and are of interest in the present connection only as possible sources of infection for cases arising in this country, which form the nucleus of this study.

LEPROSY IN AMERICAN-BORN PERSONS

The data include 497 cases of leprosy among persons born in various parts of the United States. For epidemiologic study, two groupings have been made: (1) Those born in and admitted from the same State, and designated "stationary cases;" (2) those born in one State and admitted from another, the so-called "migrant cases." The stationary cases probably are a more accurate index of geographic distribution, since the difficulty in setting accurately the time of infection in leprosy, with its variable and often prolonged incubation period, makes the actual place of origin of the migrant cases more uncertain.

Regional distribution.—The geographic distribution of the 396 patients born in and admitted from the same State, and hence presumably stationary, is shown in figure 2. Of this group, 370 patients were, by birth and admission, from California, Texas, Louisiana, and Florida, revealing four areas of concentration of the disease which have been designated "major foci." An additional case may also be associated with this group, a patient with a history of residence in Texas and California, although born in and admitted from a State outside the focal area.

Of the remainder, 17 patients were born in and admitted from States which are considered lesser foci, not so much because of the number of cases in this series, but because of the continued occurrence of the disease in these places for a long time prior to the period covered in the present paper (*2*, *3*, *4*). Fourteen patients were born in and admitted from the southeastern States of Mississippi, Alabama, Georgia, and South Carolina (2 of these had also resided in States considered major foci), and 3 patients were born in and admitted from the northwestern States of Minnesota and Wisconsin.

Four of the eight remaining cases give a history of having resided in a foreign country where the disease prevails. Thus, only 4 of the 396 stationary cases in the series fail to give a history of contact with a local or foreign focus of leprosy.

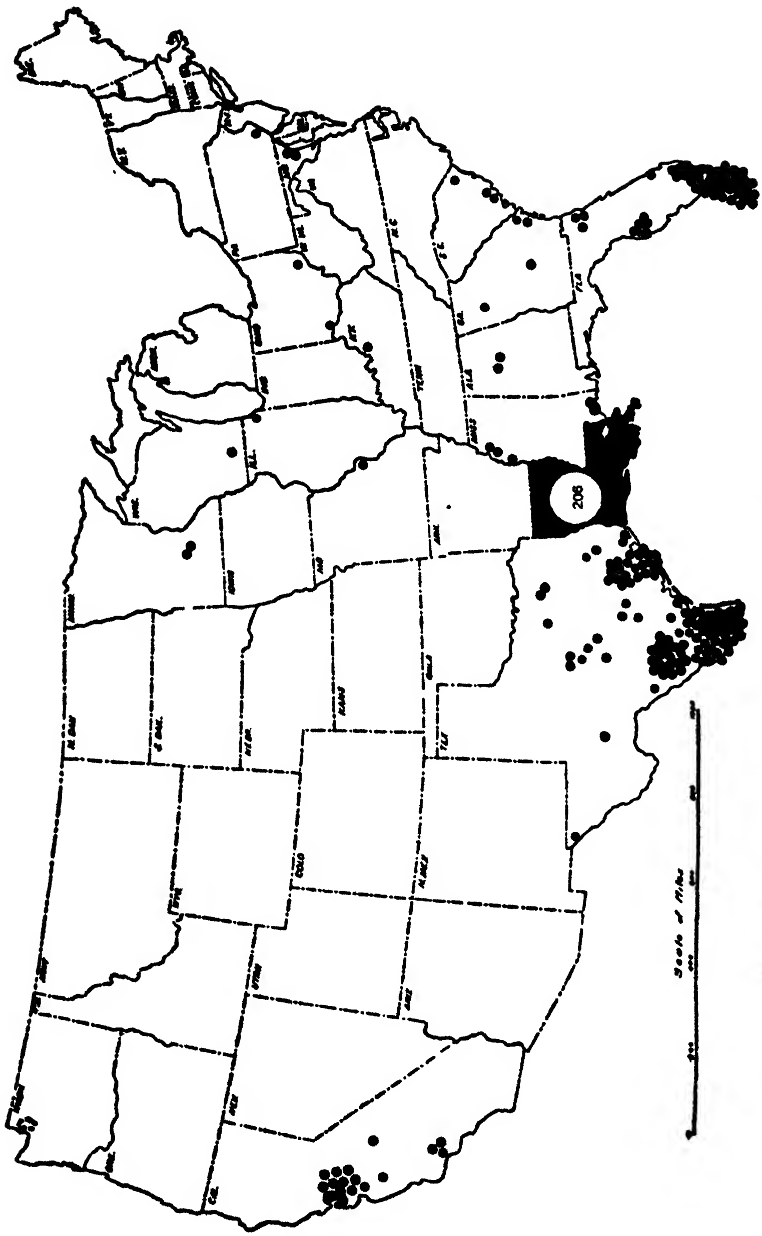

FIGURE 2.—Location of 396 cases of leprosy born in and admitted from the same State.

TABLE 2.—*Association of cases with various foci of leprosy*

	Total cases	Association with major foci				Association with lesser foci		Association with foreign foci	Sporadic cases
		Birth and admission	Birth only	Admission only	Residence only	Birth and admission	Birth only		
Born in and admitted from same State	396	370	0	0	1	17	0	4	4
Born in one State and admitted from another	101	15	28	31	4	0	4	17	2
Total	497	385	28	31	5	17	4	21	6

The 101 cases born in one State and admitted from another are shown both by birthplace and by place of admission in figure 3. They are widely scattered when considered according to either designation, yet those with a wide dispersion according to State of birth have a high degree of association according to State of admission with the leprous foci with which the 396 stationary cases are connected, and those widely dispersed by admission show a similar association by birth.

A history of association with the major foci of California, Texas, Louisiana, and Florida is given in 78 of this group of cases: 15 were born in and admitted from these four States; 28 were born in these States but admitted from elsewhere in the country; 31 were admitted from one of these foci, although born in other States; and 4 cases give a history of residence in these major foci at some time, although born in and admitted from other States. The States of Mississippi, Alabama, Georgia, and South Carolina, considered lesser foci, are given as the place of birth of 4 cases. Only 19 migrant cases, then, fail to give a history of association by residence, by admission, or by birth with a focus of the disease in this country. There is a history of contact with a foreign focus in 17 of these cases, leaving only 2 which have no association with any leprous focus (table 2).

Thus, 491 of the 497 cases of leprosy in native-born persons in this series can be allocated to known areas of prevalence of the disease either in this country or abroad, leaving only 6 cases which may be taken to represent the sporadic occurrence of the disease within the United States. Histories of these cases are as follows:

Case 1.—Negro male, admitted from Philadelphia, Pa., August 31, 1928, aged 57 years. This patient could not give a very satisfactory history, but it could not be learned that he had ever been out of Pennsylvania. He has died.

Case 2.—Male, of Italian parentage. Born in Baltimore, Md., and admitted from there on May 28, 1924, at the age of 14 years. This patient is the son of a leprous Italian-born mother and had two leprous brothers, one foreign-born and the other presumably born in the United States.

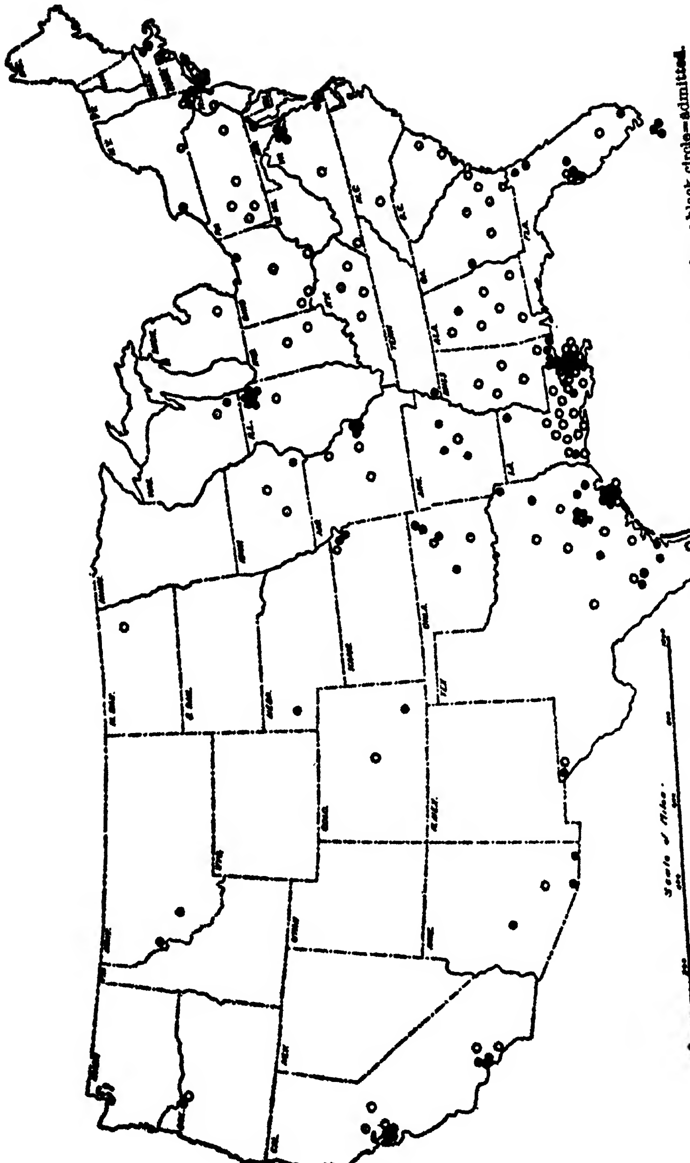

FIGURE 3.—Location of 101 cases of leprosy born in one State and admitted from another. Open circle=born; black circle=admitted.

Case 3.—Female, of German ancestry. Born in and admitted from St. Louis, Mo., March 19, 1922, aged 24 years. This woman had always lived in Missouri, though she may have gone to Illinois occasionally.

Case 4.—Female, of German ancestry. Born in Baltimore, Md., and admitted from there on June 29, 1932, aged 44 years. She lived in Norfolk, Va., for a number of years where her husband worked, but was not acquainted with any of the other patients from there, who were in the Navy. She returned to Baltimore just before the diagnosis was made. She cannot recall ever seeing or hearing of a case of leprosy prior to the recognition of the disease in herself.

Case 5.—Female, of German ancestry. Born in Kansas and admitted from Chicago, Ill., on June 13, 1937, at the age of 31 years. This patient is the daughter of case 6. Her father was of full-blood German ancestry, her mother having a mixture of Irish and American Indian ancestry (paternal) and German and some unknown ancestry (maternal).

Case 6.—Female, partly of German ancestry. Born in Lee County, Va., and admitted from Chicago, Ill., on January 19, 1939, aged 54 years. She is the mother of case 5. When she was 12 years old the family moved to Kansas, where she later married and raised a family. The mother presumably contracted the disease from her daughter, since case 5 showed symptoms 5 to 10 years earlier than did case 6.

Cases 1 and 2 are questionably sporadic and difficult to assign, because of unsatisfactory information concerning the first, and the uncertain origin of the second.

Cases 3, 4, 5, and 6, because of certain relationships between them, to be discussed, are considered in the light of one another. Geographically, they are distributed in pairs, two originating in the adjacent midwestern States of Missouri and Kansas and two in the adjacent eastern States of Maryland and Virginia. It is striking that all four are of German ancestry.

It is pertinent to recall in connection with cases 5 and 6 that our data do not include the names of patients. But the fact that two cases, one born in Kansas and one born in Virginia, were both admitted from the same city in a third State led to further inquiry, which revealed that the two patients were mother and daughter.

Racial distribution.—There is a limited correspondence in geographic distribution between the two groups of cases born in the United States and the group born outside the United States, namely, the high incidence in California, Texas, Louisiana, and Florida. On the other hand, in such States as New York, Massachusetts, Michigan, and Illinois, which have a considerable number of imported cases, there is no leprosy among the native-born population.

Racially, there is still less relationship between the native- and foreign-born cases of leprosy in the same areas. In California, we do find a proportion of domestic cases occurring in the same racial stocks as the imported cases. Texas has the largest proportion of domestic cases of the same stock as the immigrant cases, but even here numbers of cases occur in other racial groups. In Florida and

in the larger focus in Louisiana, the foreign-born and domestic cases are in different racial stocks.

The geographic and racial groupings of American-born cases thus make it evident that the introduction of leprosy from without only partially explains the existence of the leprous foci in this country. The disease may spread to individuals in the area who are of the same stock as those introducing the infection, but just as often it is associated with other racial groups living in the same area; or it may not spread at all. In no case is leprosy present in all racial stocks in the areas involved in proportion to their numbers.

The propagation of the disease, therefore, appears to be dependent in part on the presence of certain racial groups, not necessarily of the same origin as those which introduce the infection. The racial descent in the more important groups among the 396 cases born in and admitted from the same State and of the 101 migrant cases is shown in table 3, from which the general conformity in the racial composition of the two groups may be seen.

TABLE 3.—*Regional and racial distribution of leprosy among persons born in the United States*

	Racial descent																			
	French	Negro	Mexican	German	Irish	English	"American"	Chinese	Italian	Scotch	Jewish	Spanish	Dutch	Swedish	American Indian	Cuban	Norwegian	Austrian	Unknown	Total[1]
Stationary cases:																				
Louisiana	63	44	1	12	5	2	4		3	1	1	1	1		1		1		80	206
Texas	4	6	45	13	6	4	2		1	3	2	2	1						25	101
Florida		5		1	2	6	4			2		1				1			29	46
California				2	4			5			1								7	17
Mississippi		1		2				2											2	5
Georgia		2					1												1	4
South Carolina		2																	1	8
Alabama						1													1	2
Other States		1		4					3		1			2					1	12
Migrant cases	7	14	5	10	14	5	5	5	1	5	3	2	2		3	1		1	36	101
Total	74	75	51	44	31	18	16	12	8	11	8	6	4	2	4	2	1	1	183	497

[1] 54 individuals of biracial stock are listed under both races.

Involvement of a single racial stock in the four sporadic cases of domestic leprosy in this series has prompted an analysis of all the cases of the disease in persons of German descent in this country. The place of admission of foreign-born cases of German ancestry, and the birthplace and place of admission, as well as association with leprous foci here and abroad of native-born persons of German descent, are indicated in figure 4.

The concentration of cases in persons of German stock in Texas coincides with the area involved in the focus of the disease there.

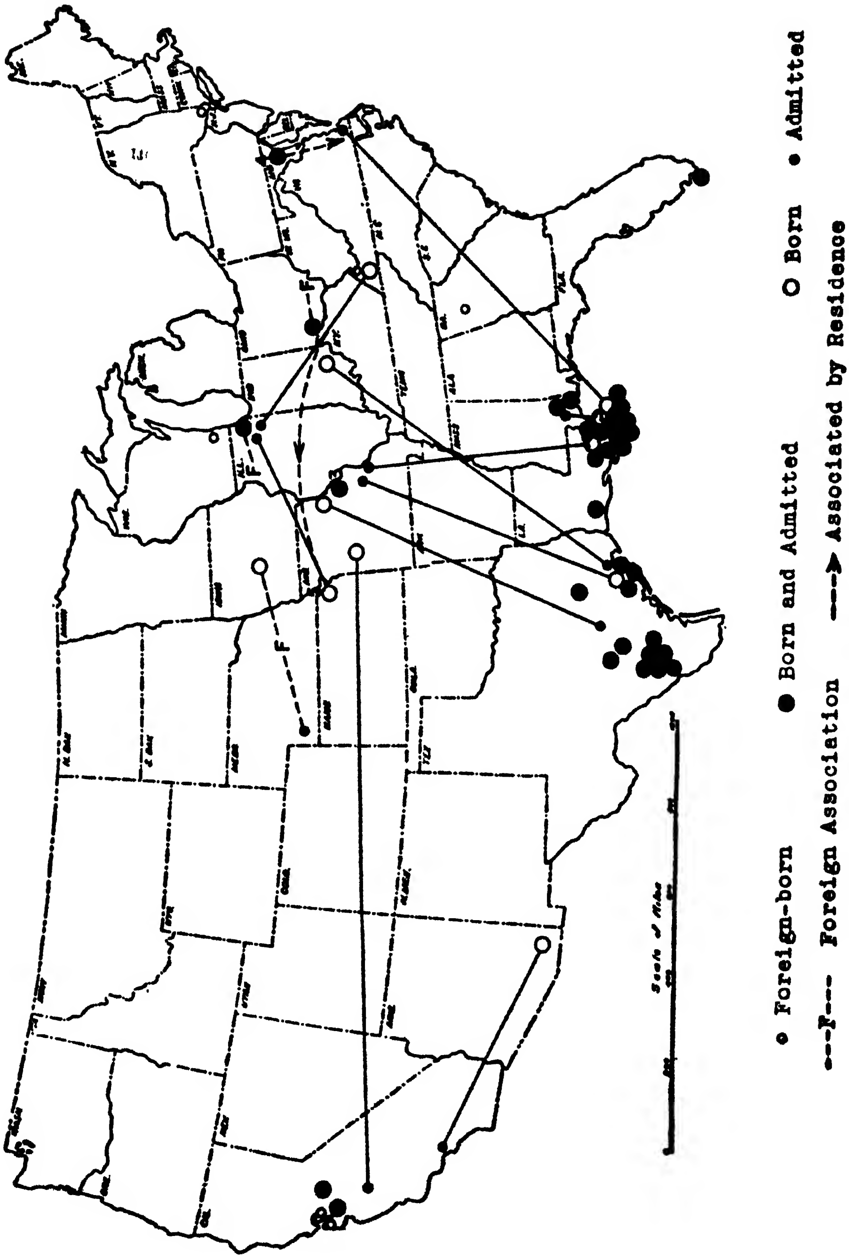

FIGURE 4.—Location of 49 cases of leprosy in persons of German stock.

Although in Louisiana the main focus of the disease in another racial group is outside of New Orleans, the concentration of cases of German stock is almost entirely within this city. The remaining cases of German descent occur in less defined areas in central United States.

Regional relationships between these cases are indicated in figure 4. One patient born in New Orleans was admitted from Norfolk, Va. Case 4 of the group of sporadic cases, it will be recalled, had resided in Norfolk. Two patients, one born in New Orleans and one in Texas, were admitted from Missouri, while one born in Missouri was admitted from Texas. One patient born in Arizona was admitted from California, and two were born in and admitted from California. Three others, from Iowa, Illinois, and Ohio, respectively, had resided in foreign foci of the disease. The proportion of persons of German descent among native- and foreign-born patients, where ancestry is given, is as follows: Of 378 foreign-born patients, 6, or 1.58 percent, were German. Of 249 native patients born in and admitted from the same State, 33, or 13.2 percent, were of German ancestry; and of 58 cases born in one State and admitted from another, 10, or 17.2 percent, were of German descent.

Three additional cases, not admitted to Carville and therefore not included, have come under the observation of the writers in the course of this study: (1) A Chinese, born in China, seen in Massachusetts in 1940 with advanced lesions, diagnosed after a residence of 12 years in this country; (2) a patient residing in Louisiana, of French descent, with a history of leprosy in both parents and a sister; (3) a patient seen in California in the summer of 1940, of German ancestry, born in Missouri.

The first of these cases illustrates leprosy in a foreign-born individual coming from a known focus, living in this country in a nonfocal area, with no evidence of spread. The second case illustrates the occurrence of stationary leprosy in a focal area of the United States, in a native-born individual of the racial stock heavily involved, and of a family known to be leprous. The third instance illustrates the occurrence of a migrant case of leprosy in an individual born in central United States, of a racial stock in which a number of individuals have developed leprosy either in the area or following association with a focus of leprosy in this country or abroad.

Each of these three cases is an illustration of one of the features of the disease brought out in the study of the whole group. This conformity to the series is a further indication that regional, racial, and familial relationships of the disease shown in the whole group are not fortuitous, but are characteristics of the disease in the United States.

CONCLUSIONS

The prevalence of leprosy in certain areas in the United States appears to be dependent in part on the presence of cases as sources of infection, and in part on the presence in these areas of individuals of certain racial stocks or families.

The regional, racial, and familial relationships in certain of the cases in persons of German descent suggest a further study of familial occurrence in this and other racial groups within the United States.

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(3) Denney, O. E.: Leprosy in the southern United States. South. Med. J. **26**: 763 (1933).

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SPOROZOITES OF *PLASMODIUM LOPHURAE*, AN AVIAN MALARIA PARASITE, IN *ANOPHELES QUADRIMACULATUS*[1]

By Herbert S. Hurlbut and Reginal Hewitt

Coggeshall (*1*) has recently reported the development of *Plasmodium lophurae* to the oöcyst stage in *Anopheles quadrimaculatus*. Following this lead, we have succeeded in obtaining sporozoites of this species in *A. quadrimaculatus* fed on infected ducks. All mosquitoes were kept at approximately 75° F. Dissections were made over a period of 4 to 27 days after the infective feeding. Seven out of twenty-nine dissections were positive for oöcysts and one for sporozoites. The first oöcysts were found on the seventh day and the single gland-positive specimen on the twenty-second day. The gland-positive specimen had developed an extremely heavy stomach infection, oöcysts being so numerous that they covered the greater part of the surface of the stomach. Sporozoites were few in number but most of the oöcysts had not yet developed to maturity. In normal saline the sporozoites showed slight motility, and characteristic morphology was observed in a stained preparation. Transmission of the parasite has not yet been accomplished.

In addition to Coggeshall, two other workers have reported infection of anopheline mosquitoes with avian malaria parasites, but neither of these progressed beyond the oöcyst stage. Mayne (*2*) found oöcysts of *P. relictum* in *A. subpictus* experimentally fed on an infected sparrow, and in other mosquitoes caught in a room where infected birds were

[1] From the Health and Safety Department, Tennessee Valley Authority, Wilson Dam, Alabama.

kept. Lucena (*3*) describes an experimental infection of *A. strodei* with *P. cathemerium*, but only a single oöcyst was found.

From the standpoint of certain types of laboratory research on malaria large avian hosts are desirable. However, in this country at least, no mosquito vector has been found for the species of malaria now available in large bird hosts, so far as is known to the writers. It is interesting, therefore, that development of *P. lophurae* to the sporozoite stage can occur in *A. quadrimaculatus*, although further work may show that this mosquito is not capable of transmitting the parasite.

Considerable importance is sometimes attached to oöcyst and sporozoite indices in *A. quadrimaculatus* associated with endemic human malaria. It appears, therefore, that some method should be sought to distinguish between the exogenous stages of human and avian malaria in this species, since the finding reported here tends to invalidate the assumption that all oöcysts and sporozoites which may be found are those of human malaria. Apparently very few attempts have been made to infect *A. quadrimaculatus* with species of avian malaria other than *P. lophurae* or *P. relictum.*

REFERENCES

(*1*) Coggeshall: J. Parasitol., **26** (Supp.): 44–45 (1940).
(*2*) Mayne: Indian J. Med. Res., **16**: 557–558 (1928).
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COURT DECISION ON PUBLIC HEALTH

Retail food seller held liable for tularemia infection.—(Ohio Supreme Court; *Rubbo* v. *Hughes Provision Co.*, 34 N.E.2d 202; decided April 30, 1941.) In an action against a provision company it appeared that the husband of the plaintiff purchased some rabbits from the defendant's market, which rabbits the plaintiff prepared and cooked. After eating the rabbit meat the plaintiff became ill with tularemia. The rabbits were sold at a counter which was rented by the defendant to a third person, but the advertisement regarding the sale of the rabbits was by the defendant and the purchase was made without knowledge of the arrangements between the defendant and its lessee and in the belief that the defendant was the seller of all merchandise in the market. The judgment of the trial court, affirmed by the court of appeals, was in favor of the plaintiff.

When the cause reached the supreme court one of the questions submitted by the defendant for decision was whether the doctrine of agency by estoppel applied. Regarding this the supreme court said that it agreed with the court of appeals in its opinion that, when the provision company advertised the sale of rabbits in its place of busi-

ness, prospective purchasers going to the company's place of business had a right to assume that the company was selling those rabbits through its employees, in the absence of knowledge to the contrary, and that the company, under these circumstances, was estopped from denying it was selling rabbits. That being so, the supreme court said that the same rules of law applied as if the seller of the rabbits was, in fact, defendant's agent.

Another question presented was whether the trial court had erred in charging that the violation of section 12760, General Code, constituted negligence per se. That section provided that whoever sold, offered for sale, or had in possession with intent to sell, diseased, corrupted, adulterated, or unwholesome provisions without making the condition thereof known to the buyer should be penalized. The supreme court took the view that the rule of law applied in a prior case also applied in the instant case. In such earlier case it was held (*a*) that the violation of the State pure food laws by the sale of unwholesome meat was negligence per se and could be the basis of recovery for damages by the user of such unwholesome meat who suffered injury proximately resulting therefrom, provided the user was not himself guilty of negligence in the care, preparation, cooking, or in any other manner which contributed directly to his injury, and (*b*) that lack of intent to violate the law or ignorance of the condition of the meat at the time it was sold was no defense.

The judgment for the plaintiff was affirmed.

DEATHS DURING WEEK ENDED JUNE 14, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended June 14, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,776	7,956
Average for 3 prior years	7,755	
Total deaths, first 24 weeks of year	214,534	216,208
Deaths per 1,000 population, first 24 weeks of year, annual rate	12.5	12.6
Deaths under 1 year of age	511	520
Average for 3 prior years	494	
Deaths under 1 year of age, first 24 weeks of year	12,609	12,215
Data from industrial insurance companies:		
Policies in force	64,445,165	65,298,017
Number of death claims	11,685	12,063
Death claims per 1,000 policies in force, annual rate	9.5	9.7
Death claims per 1,000 policies, first 24 weeks of year, annual rate	10.2	10.3

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JUNE 21, 1941

Summary

A sharp rise occurred in the incidence of poliomyelitis during the current week, with 67 cases reported for the country as a whole as compared with 26 for the preceding week. An increase of one or more cases was recorded in all geographic areas except the Middle Atlantic, the largest being for the South Atlantic States, which reported 28 cases as compared with 5 last week. The following named States reported the most significant increases and the largest numbers of cases: Florida, from 3 to 15; Georgia, from 0 to 9; Illinois, from 3 to 7; South Carolina, from 1 to 3; and Mississippi, from 2 to 4. California reported 7 cases as compared with 6 last week. The local distribution of the cases in Florida is not available. None was reported from Miami.

The total number of cases of poliomyelitis for the current week is slightly above the 5-year (1936–40) median (51). For the corresponding week of 1939 and 1937, 83 and 82 cases were reported, respectively. The total number of cases reported to date this year (first 25 weeks) is 636, as compared with a cumulative 5-year median of 657.

The incidence of measles declined in all geographic areas. A total of 16,194 cases was reported as compared with 21,420 for the preceding week. Of 48 cases of meningococcus meningitis, 6 cases were reported in New York, 4 each in Massachusetts, Ohio, and West Virginia, and 3 each in Maryland, Oregon, and California. A total of 32 cases of Rocky Mountain spotted fever was reported, as compared with 23 cases for the preceding week, and 46 cases of endemic typhus fever (18 in Texas, 10 in Alabama, 7 in Georgia, and 5 each in Florida and Louisiana) as compared with 50 last week.

The death rate for the current week in 88 major cities in the United States is 10.9 per 1,000 population, the same as for the preceding week. The 3-year (1938–40) average for the corresponding week is 10.5. The cumulative rate to date this year (first 25 weeks) is 12.4, as compared with 12.5 for the corresponding period of 1940.

Telegraphic morbidity reports from State health officers for the week ended June 21, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40
	June 21, 1941	June 22, 1940		June 21, 1941	June 22, 1940		June 21, 1941	June 22, 1940		June 21, 1941	June 22, 1940	
NEW ENG.												
Maine	0	0	1	------	6	------	111	317	143	0	0	0
New Hampshire	0	0	0	------	------	------	3	18	18	0	0	0
Vermont	0	0	0	------	------	------	47	6	97	0	0	0
Massachusetts	3	3	2	------	------	------	759	1,164	711	4	0	1
Rhode Island	0	1	1	------	------	------	1	118	43	0	0	0
Connecticut	0	1	3	2	1	1	422	13	69	0	0	0
MID. ATL.												
New York	13	9	30	------	[1] 7	[1] 4	1,830	832	1,146	6	1	4
New Jersey	4	8	8	2	1	3	986	933	647	1	0	1
Pennsylvania	9	7	15	------	------	------	2,379	463	587	0	4	7
E. NO. CEN.												
Ohio [2]	15	16	16	3	11	8	1,280	40	217	4	1	1
Indiana [3]	3	0	5	3	2	2	218	12	12	0	3	1
Illinois	25	21	32	6	2	9	598	217	217	1	1	3
Michigan [3]	4	4	8	------	8	1	960	508	288	0	0	1
Wisconsin	4	4	4	28	9	13	1,222	954	400	0	0	1
W. NO. CEN.												
Minnesota	0	0	2	------	------	1	16	65	91	0	0	0
Iowa [2]	1	10	3	1	------	------	126	141	84	0	1	0
Missouri [2]	1	1	7	------	2	9	238	16	16	1	0	0
North Dakota	0	1	1	2	------	2	13	4	4	0	0	0
South Dakota	1	0	0	------	------	------	2	3	2	0	0	0
Nebraska	1	1	1	------	------	------	6	17	19	0	0	0
Kansas	7	4	5	------	------	1	152	225	54	0	0	0
SO. ATL.												
Delaware [3]	0	0	0	------	------	------	24	2	3	0	0	0
Maryland [2] [3]	4	1	3	4	2	1	366	1	81	3	0	2
Dist. of Col.	1	0	3	------	------	------	111	3	43	1	0	1
Virginia	8	5	6	16	22	------	528	138	138	2	3	3
West Virginia [2] [3]	2	3	4	7	3	5	453	20	40	4	1	1
North Carolina	7	4	9	1	------	------	719	84	192	1	0	2
South Carolina	0	6	4	111	110	52	270	18	19	0	0	1
Georgia [4]	7	2	3	27	2	------	196	53	42	9	0	0
Florida [4]	2	1	4	9	------	1	50	32	13	1	0	0
E. SO. CEN.												
Kentucky	2	4	3	------	12	8	246	102	63	1	0	3
Tennessee	3	0	3	15	9	10	178	50	48	0	0	1
Alabama [4]	1	7	7	9	1	5	89	72	47	0	2	2
Mississippi [3] [4]	3	1	3	------	------	------	------	------	------	1	1	1
W. SO. CEN.												
Arkansas	4	6	1	7	10	4	156	17	11	0	1	0
Louisiana [4]	1	3	10	2	19	9	3	2	8	0	1	1
Oklahoma	3	1	2	10	6	14	84	10	20	0	0	1
Texas [4]	13	20	20	237	80	80	489	379	174	2	1	1
MOUNTAIN												
Montana [2]	1	1	0	1	------	------	9	49	49	0	0	0
Idaho [2]	0	0	0	------	------	------	8	9	18	0	1	0
Wyoming [2]	4	0	0	------	2	------	5	8	5	0	0	0
Colorado [2]	7	15	5	12	1	------	108	44	46	0	0	0
New Mexico	1	1	3	------	------	------	82	62	16	0	0	0
Arizona	2	2	2	47	21	18	81	43	12	0	1	0
Utah [2] [3]	0	3	0	1	------	------	48	204	81	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	2	1	------	------	------	12	141	141	0	0	0
Oregon	1	8	1	4	------	8	38	127	34	3	0	0
California	13	15	22	[5] 842	56	20	477	174	511	3	0	2
Total	181	202	292	1,409	405	437	16,194	7,910	7,968	48	23	44
25 weeks	6,395	7,629	11,350	594,479	166,266	149,068	788,425	201,321	246,888	1,172	967	1,857

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 21, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40	Week ended—		Median, 1936–40
	June 21, 1941	June 22, 1940		June 21, 1941	June 22, 1940		June 21, 1941	June 22, 1940		June 21, 1941	June 22, 1940	
NEW ENG.												
Maine	0	0	0	3	7	7	0	0	0	0	2	1
New Hampshire	0	0	0	2	1	5	0	0	0	0	0	0
Vermont	1	0	0	2	3	3	0	0	0	3	1	0
Massachusetts	0	1	1	139	81	183	0	0	0	4	1	1
Rhode Island	0	0	0	5	0	11	0	0	0	1	3	1
Connecticut	1	0	0	29	36	36	0	0	0	2	2	1
MID. ATL.												
New York	0	0	1	316	328	328	0	0	0	11	7	10
New Jersey	1	0	0	132	161	70	0	0	0	2	0	2
Pennsylvania	1	0	0	172	163	174	0	0	0	7	8	8
E. NO. CEN.												
Ohio [1]	3	1	1	131	117	92	0	0	0	4	5	5
Indiana [2]	0	1	1	24	23	32	0	3	6	4	2	4
Illinois	7	1	1	156	317	247	5	14	9	7	4	7
Michigan [3]	1	5	1	242	148	283	0	1	1	4	3	2
Wisconsin	0	0	0	54	67	84	1	0	2	0	2	2
W. NO. CEN.												
Minnesota	2	1	1	23	26	48	0	1	8	0	0	0
Iowa [2]	0	1	0	14	21	23	2	2	17	2	2	2
Missouri [3]	0	1	0	30	11	25	0	0	2	0	16	6
North Dakota	0	0	0	1	12	13	0	0	1	0	0	0
South Dakota	1	0	0	2	7	6	0	1	1	1	0	0
Nebraska	0	1	0	9	11	11	0	1	5	0	1	0
Kansas	0	0	0	18	16	33	0	0	3	0	3	3
SO. ATL.												
Delaware [2]	0	0	0	6	4	1	0	0	0	0	1	0
Maryland [2] [3]	0	1	0	29	19	19	0	0	0	0	1	3
Dist. of Col.	0	1	0	6	6	6	0	0	0	0	1	0
Virginia	0	2	2	7	5	11	0	0	0	1	3	6
West Virginia [2] [3]	0	1	1	9	15	15	0	0	1	2	3	4
North Carolina	1	1	1	13	9	13	0	0	0	3	5	9
South Carolina	3	0	0	2	3	2	0	0	0	6	4	12
Georgia [4]	9	1	1	8	6	8	0	0	0	15	17	30
Florida [4]	15	0	1	4	1	3	0	0	0	2	2	2
E. SO. CEN.												
Kentucky	1	2	1	42	24	15	3	0	0	3	7	11
Tennessee	0	0	1	15	23	10	2	0	0	9	5	16
Alabama [4]	3	0	5	4	9	4	0	1	0	3	9	9
Mississippi [2] [4]	4	0	0	1	4	4	0	1	1	2	2	8
W. SO. CEN.												
Arkansas	0	0	0	2	4	6	0	4	3	10	6	9
Louisiana [4]	1	1	1	6	5	5	0	0	0	11	23	22
Oklahoma	1	1	1	3	8	9	0	0	3	4	5	10
Texas [4]	2	3	1	18	18	27	0	5	3	11	28	26
MOUNTAIN												
Montana [3]	0	0	0	12	5	8	0	0	1	2	1	1
Idaho [3]	0	0	0	1	6	6	1	0	0	1	2	1
Wyoming [3]	1	0	0	4	3	3	0	0	1	0	0	0
Colorado [3]	0	0	0	10	17	18	0	3	1	0	2	2
New Mexico	0	0	0	5	0	9	0	0	0	1	1	2
Arizona	1	0	0	3	3	3	2	0	0	3	4	3
Utah [2] [3]	0	0	0	2	2	12	0	0	0	0	0	1
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	9	0	10	29	25	1	0	0	0	2	2
Oregon	0	0	0	7	6	23	1	2	3	1	2	2
California	7	15	9	112	75	107	1	1	7	6	11	10
Total	67	51	51	1,845	1,865	2,168	19	40	141	148	209	271
25 weeks	636	697	657	85,449	111,454	128,743	1,084	1,725	7,219	2,249	2,451	3,370

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 21, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended— June 21, 1941	Whooping cough, Week ended— June 22, 1940
NEW ENG.		
Maine	22	13
New Hampshire	2	10
Vermont	21	15
Massachusetts	188	116
Rhode Island	20	5
Connecticut	49	54
MID. ATL.		
New York	283	300
New Jersey	90	94
Pennsylvania	250	301
E. NO. CEN.		
Ohio [2]	330	204
Indiana [2]	13	24
Illinois	102	93
Michigan [2]	0	207
Wisconsin	123	92
W. NO. CEN.		
Minnesota	70	34
Iowa [2]	24	44
Missouri [2]	12	30
North Dakota	16	13
South Dakota	1	1
Nebraska	6	19
Kansas	156	56
SO. ATL.		
Delaware [2]	7	1
Maryland [2] [3]	75	148
Dist. of Col.	10	4
Virginia	103	52
West Virginia [2] [3]	49	33
North Carolina	155	155
SO. ATL.—continued		
South Carolina	168	8
Georgia [4]	23	20
Florida [4]	10	9
E. SO. CEN.		
Kentucky	52	75
Tennessee	78	81
Alabama [4]	40	19
Mississippi [3] [4]		
W. SO. CEN.		
Arkansas	61	31
Louisiana [4]	16	32
Oklahoma	12	34
Texas [4]	401	259
MOUNTAIN		
Montana [2]	31	1
Idaho [2]	18	9
Wyoming [2]	5	7
Colorado [2]	162	24
New Mexico	16	17
Arizona	55	11
Utah [2] [3]	87	159
Nevada	0	
PACIFIC		
Washington	61	63
Oregon	18	81
California	658	368
Total	4,139	3,426
25 weeks	116,118	80,316

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended June 21, 1941, 32 cases, as follows: Ohio, 1; Indiana, 1; Iowa, 1; Missouri, 1; Delaware, 1; Maryland, 3; West Virginia, 1; Montana, 10; Idaho, 1; Wyoming, 5, Colorado, 2; Utah, 2.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended June 21, 1941, 46 cases, as follows: Georgia, 7; Florida, 5; Alabama, 10; Mississippi, 1; Louisiana, 5; Texas, 18.
[5] Delayed reports.

PLAGUE INFECTION IN FLEAS FROM GROUND SQUIRRELS IN KERN COUNTY, CALIF.

Under date of June 11, 1941, Dr. N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved, by animal inoculation and cultures, in a pool of 91 fleas from 5 ground squirrels, *C. beecheyi*, submitted to the laboratory on May 23, 1941, from a ranch 1 mile south of Cummings Valley School, Kern County, Calif.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 7, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	109	42	21	3,792	372	1,297	14	367	31	1,212	-------
Current week [1]	50	48	12	6,694	285	979	0	357	31	1,445	-------
Maine:											
Portland	0	------	0	1	0	1	0	0	0	1	18
New Hampshire:											
Concord	0	------	0	0	0	2	0	0	0	0	9
Nashua	0	------	0	0	0	0	0	0	0	6	7
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	3
Burlington	1	------	0	1	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	3
Massachusetts:											
Boston	1	------	0	249	0	69	0	12	1	76	197
Fall River	1	------	0	2	2	1	0	0	0	4	31
Springfield	0	------	0	70	1	14	0	2	0	13	43
Worcester	0	------	0	29	2	5	0	0	0	0	57
Rhode Island:											
Pawtucket	1	------	0	0	0	0	0	0	0	5	14
Providence	0	------	0	0	1	2	0	2	0	18	44
Connecticut:											
Bridgeport	0	------	0	24	0	2	0	2	0	2	34
Hartford	0	------	0	4	1	8	0	1	0	2	35
New Haven	0	------	0	6	1	9	0	0	1	2	30
New York:											
Buffalo	0	------	0	46	19	28	0	5	0	14	152
New York	22	7	2	1,139	45	224	0	72	5	118	1,345
Rochester	0	------	0	205	3	2	0	0	1	23	62
Syracuse	0	------	0	11	3	2	0	0	1	28	42
New Jersey:											
Camden	2	------	0	6	0	5	0	0	0	1	34
Newark	0	------	0	52	5	8	0	8	0	16	116
Trenton	0	------	0	66	0	5	0	4	0	1	42
Pennsylvania:											
Philadelphia	2	1	1	282	16	94	0	24	3	67	438
Pittsburgh	2	1	0	951	8	20	0	3	1	37	161
Reading	0	------	0	135	1	6	0	0	0	2	17
Scranton	0	------	-------	69	-------	1	0	-------	0	0	-------
Ohio:											
Cincinnati	1	------	0	19	2	3	0	7	0	6	134
Cleveland	0	1	0	28	6	43	0	8	1	81	170
Columbus	1	------	0	43	3	10	0	0	0	17	80
Toledo	0	------	0	521	1	0	0	5	0	33	92
Indiana:											
Anderson	0	------	0	9	1	0	0	0	0	0	7
Fort Wayne	0	------	0	9	1	0	0	0	0	4	20
Indianapolis	1	------	0	298	10	4	0	7	0	19	128
Muncie	0	------	0	24	1	3	0	0	0	2	11
South Bend	0	------	0	22	0	0	0	0	0	0	8
Terre Haute	0	------	0	3	1	1	0	0	0	0	17
Illinois:											
Alton	0	------	0	9	0	0	0	0	1	0	1
Chicago	5	1	0	161	22	98	0	38	0	31	650
Elgin	0	------	0	4	1	1	0	0	0	1	7
Springfield	0	------	0	47	0	1	0	0	0	0	20
Michigan:											
Detroit	1	2	0	435	12	104	0	18	0	94	263
Flint	0	------	0	28	4	6	0	0	0	19	19
Grand Rapids	0	------	0	104	0	9	0	0	0	10	28
Wisconsin:											
Kenosha	0	------	0	33	0	3	0	0	0	0	10
Madison	0	------	0	10	0	2	0	0	0	2	9
Milwaukee	1	1	1	617	1	23	0	1	0	46	113
Racine	0	------	0	52	0	5	0	0	0	6	7
Superior	0	------	0	1	0	0	0	0	0	16	8

[1] Figures for Raleigh, Boise, and mortality figures for Salt Lake City estimated; reports not received.

City reports for week ended June 7, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0		0	0	3	0	0	0	0	23	32
Minneapolis	0		0	8	1	16	0	0	2	15	105
St. Paul	0	1	1	1	1	4	0	3	0	17	60
Iowa:											
Cedar Rapids	0			6		0	0		0	0	
Davenport	0			0		0	0		0	0	
Des Moines	0			2		2	0		0	2	34
Sioux City	0			4		2	0		0	11	
Waterloo	0			38		0	0		0	2	
Missouri:											
Kansas City	0		0	110	2	6	0	3	0	17	76
St. Joseph	0		0	10	5	0	0	3	0	1	28
St. Louis	0		0	217	4	22	0	5	0	28	190
North Dakota:											
Fargo	0		0	0	0	0	0	0	0	21	9
Grand Forks	0			0		0	0		0	0	
Minot	0			6		0	0		0	1	9
South Dakota:											
Aberdeen	0			0		0	0		0	1	
Sioux Falls	0			0		3	0		0	0	7
Nebraska:											
Lincoln	0			3		1	0		0	2	
Omaha	0		0	7	6	3	0	1	0	0	49
Kansas:											
Lawrence	0		0	2	0	0	0	0	0	4	7
Topeka	0		0	26	2	0	0	0	0	27	16
Wichita	0	1	0	7	0	0	0	1	0	4	21
Delaware:											
Wilmington	0		0	8	3	5	0	0	0	0	32
Maryland:											
Baltimore	1	3	2	294	9	11	0	14	0	81	187
Cumberland	0		0	2	0	0	0	0	0	0	13
Frederick	0		0	0	0	0	0	0	0	0	4
Dist. of Col.:											
Washington	0		0	199	8	8	0	9	0	11	158
Virginia:											
Lynchburg	0		0	24	0	0	0	1	2	1	10
Norfolk	0		0	20	0	0	0	1	0	3	26
Richmond	0		1	71	2	0	0	0	0	0	57
Roanoke	0		0	7	0	1	0	0	0	0	12
West Virginia:											
Charleston	0		0	0	3	0	0	1	0	0	26
Huntington	0			5		0	0		0	0	
Wheeling	0		0	43	3	3	0	0	0	3	19
North Carolina:											
Gastonia	0			2		1	0		0	0	
Raleigh											
Wilmington	0		0	9	0	0	0	0	0	25	9
Winston-Salem	0		0	10	2	0	0	1	0	6	15
South Carolina:											
Charleston	0		0	0	0	0	0	3	1	1	19
Florence	0		0	0	2	0	0	0	0	7	10
Greenville	0		0	3	2	0	0	0	0	1	13
Georgia:											
Atlanta	1		1	44	2	2	0	4	1	1	69
Brunswick	0		0	4	0	0	0	0	0	0	5
Savannah	0	1	0	11	0	1	0	3	0	0	30
Florida:											
Miami	0		0	4	1	0	0	1	3	6	37
St. Petersburg	0		0	3	1	0	0	1	1	0	20
Tampa	0		0	0	0	0	0	1	0	2	21
Kentucky:											
Ashland	0		0	7	0	0	0	0	0	5	
Covington	0		0	0	1	0	0	0	0	0	11
Lexington	0		0	0	1	0	0	2	0	0	15
Louisville	0		0	428	5	24	0	4	0	9	87
Tennessee:											
Knoxville	1		0	20	1	4	0	1	1	1	27
Memphis	0	6	0	70	2	0	0	1	0	4	78
Nashville	0		1	21	2	6	0	2	0	12	50
Alabama:											
Birmingham	0	3	0	6	3	2	0	4	0	3	61
Mobile	0		0	0	0	0	0	1	0	0	20
Montgomery	0	1		0		0	0		0	0	

City reports for week ended June 7, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Arkansas:											
Fort Smith	1			0		0	0		0	0	
Little Rock	0		0	3	2	0	0	4	2	0	49
Louisiana:											
Lake Charles	0		0	1	0	0	0	0	0	0	6
New Orleans	1		0	5	4	2	0	12	2	0	106
Shreveport	0		0	0	4	2	0	3	3	3	27
Oklahoma:											
Oklahoma City	0	1	0	7	3	0	0	1	0	2	45
Tulsa	0		0	38	1	1	0	0	0	2	10
Texas											
Dallas	1		0	18	5	0	0	6	0	1	61
Fort Worth	0		0	2	1	1	0	0	0	0	34
Galveston	0		0	0	1	4	0	0	0	0	15
Houston	0		0	3	8	4	0	8	2	1	98
San Antonio	1	2	1	1	2	1	0	9	0	2	79
Montana											
Billings	0		0	0	1	0	0	0	0	0	5
Great Falls	0		0	3	0	1	0	0	0	1	6
Helena	0		0	4	0	0	0	0	0	0	2
Missoula	0		0	0	1	0	0	0	0	0	8
Idaho.											
Boise											
Colorado:											
Colorado Springs	0		0	6	2	6	0	0	0	2	9
Denver	3	8	1	154	4	2	0	6	0	105	82
Pueblo	0		0	10	1	2	0	0	0	13	5
New Mexico:											
Albuquerque	0		0	3	0	0	0	2	0	0	11
Arizona:											
Phoenix	0	31		0		0	0		0	15	
Utah:											
Salt Lake City	0			3		3	0		0	15	
Washington:											
Seattle	1		0	0	3	1	0	2	0	29	104
Spokane	0		0	4	2	3	0	1	0	8	38
Tacoma	0		0	6	1	3	0	0	0	22	32
Oregon:											
Portland	1		0	0	5	4	0	2	0	0	89
Salem	0			1		0	0		0	0	
California											
Los Angeles	0	8	0	61	4	25	0	18	2	63	318
Sacramento	0	1	0	4	3	2	0	2	0	41	39
San Francisco	1		0	2	4	5	0	10	0	31	141

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases	State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:				Michigan:			
Boston	3	0	0	Detroit	1	0	0
New York:				Missouri:			
Buffalo	1	0	0	St. Joseph	0	1	0
New York	1	0	2	Maryland:			
New Jersey:				Baltimore	3	0	1
Camden	0	1	0	Louisiana:			
Pennsylvania:				Shreveport	0	1	0
Scranton	1	1	0	Texas:			
Ohio:				Dallas	0	1	0
Toledo	1	1	0	California:			
				Los Angeles	1	1	3

Encephalitis, epidemic or lethargic.—Cases: Philadelphia, 1. Deaths: New York, 1; Chicago, 1; Louisville, 1; Albuquerque, 1; Sacramento, 1.
Pellagra.—Cases: Philadelphia, 1; Savannah, 4; Dallas, 2; Sacramento, 1.
Rabies in man.—Deaths: Wilmington, N. C., 1.
Typhus fever.—Cases: Savannah, 1; Miami, 3.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 24, 1941.—During the week ended May 24, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		6		7	9			2	6	30
Chickenpox		33		104	130	65	12	40	29	413
Diphtheria		10	1	16	2	2	2			33
Dysentery				6						6
Influenza		8			2				6	16
Measles		76	64	606	1,313	97	26	83	187	2,402
Mumps		1	1	262	149	19	53	5	18	508
Pneumonia		8			4	1			9	22
Scarlet fever	1	24	1	151	129	8	11	4	20	349
Smallpox							1			1
Tuberculosis		4	7	126	50	56	1			244
Typhoid and paratyphoid fever				13	2					15
Whooping cough				117	145	1	1	9	27	300

CUBA

Habana—Communicable diseases—4 weeks ended May 31, 1941.—During the 4 weeks ended May 31, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths
Diphtheria	18	2
Malaria	1	
Tuberculosis		2
Typhoid fever	21	

SWITZERLAND

Communicable diseases—March 1941.—During the month of March 1941, cases of certain communicable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	31	Mumps	101
Chickenpox	217	Paratyphoid fever	8
Diphtheria	72	Poliomyelitis	4
German measles	158	Scarlet fever	288
Influenza	108	Tuberculosis	255
Lethargic encephalitis	1	Typhoid fever	8
Malaria	1	Undulant fever	8
Measles	369	Whooping cough	157

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–March 1941	April 1941	May 1941—week ended—				
				3	10	17	24	31
ASIA								
China:								
Canton.[1]								
Hong Kong	C	567	117	28	35	32		
Macao	C			10	16	29	49	58
India:								
Calcutta	C	1,164	504					
Rangoon	C	28	4		10			
India (French)	C	10						

[1] A report dated May 21, 1941, states that up to May 19, 52 cases of cholera with 27 deaths were reported in Canton, China.

PLAGUE

[C indicates cases; D, deaths]

Place		January–March 1941	April 1941	May 3	May 10	May 17	May 24	May 31
AFRICA								
Belgian Congo	C	1						
British East Africa:								
Kenya	C	10						
Uganda	C	41						
Madagascar	C	172	11					[1] 8
Morocco	C	617	181	71	47	74	109	45
Tunisia: Tunis	C	2						
Union of South Africa	C	33	3					
ASIA								
Dutch East Indies:								
Java and Madura	C	252						
West Java	C	162						
India:								
Calcutta	C	3						
Rangoon	C	2		2				
Thailand. Lampang Province	C		1					
SOUTH AMERICA								
Argentina: Cordoba Province	C	1						
Peru:								
Lambayeque Department	C	2						
Libertad Department	C	6						
Lima Department	C	5						
OCEANIA								
Hawaii Territory: Plague-infected rats		10	1	4	6	1	9	
New Caledonia	C	7						

[1] For the month of May.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths]

Place		January–March 1941	April 1941	May 1941—week ended—				
				3	10	17	24	31
AFRICA								
Algeria	C	79	24	11				
British East Africa	C	9						
Dahomey	C	351	16					[1] 85
French Guinea	C	20	3					[1] 22
Ivory Coast	C	21	9					
Morocco	C	27	4					
Nigeria	C	323	74					
Niger Territory	C	124	71					[1] 26
Portuguese East Africa	C	9						
Rhodesia, Southern	C	86						
Senegal	C	30	13					[1] 9
Sierra Leone	C		15					
Sudan (Anglo-Egyptian)	C	5	2					
Sudan (French)	C	14	5					
ASIA								
Ceylon [2]	C		6					
China	C	114	24	6	10	6	1	2
Chosen	C	[3] 207						
India	C	9,803	104					
India (French)	C	4						
India (Portuguese)	C	44						
Indochina (French)	C	325	180					[1] 197
Iran	C	4						
Iraq	C	892						
Japan	C	92	10					
Straits Settlements	C	1						
Syria	C	1						
Thailand	C	80	16	30	10	9	43	23
EUROPE								
France	C	1						
Portugal	C	12	6	1			1	
Spain	C	97	1					
NORTH AMERICA								
Canada	C	8	10		9			
Cuba	C		1					
Dominican Republic	C	2						
Guatemala	C	3	1					
Mexico	C	18						
SOUTH AMERICA								
Colombia	C	220	8	1				
Uruguay	C	7						
Venezuela (alastrim)	C	47	24					

[1] For the month of May.

[2] A report dated May 16, 1941, states that within the last few weeks 20 cases of smallpox were reported in Colombo, Ceylon, and 12 cases in other localities of Ceylon.

[3] For the month of January.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January-March 1941	April 1941	May 1941—week ended— 3	10	17	24	31
AFRICA								
Algeria	C	2,080	1,047					[1] 1,255
Egypt	C	385						
Morocco	C	139	102	29	22	44		49
Sierra Leone	C	4	1					
Tunisia	C	294	712	201	217	199	254	
Union of South Africa	C	113	2					
ASIA								
China	C	55	30			2		
Chosen	C	[2] 5						
Iran	C	60						
Iraq	C	13						
Japan	C	125	84					
Straits Settlements	C	2						
EUROPE								
Bulgaria	C	71	9	21		14		
Germany	C	355	199	47	49			
Greece	C	7						
Hungary	C	91	45	29	34		34	
Irish Free State	C	9	4				13	
Poland	C	145						
Rumania	C	439	47	10	20		9	17
Spain	C	600	886			255		
Switzerland	C	2						
Turkey	C	[3] 175						
Yugoslavia	C	78						
NORTH AMERICA								
Guatemala	C	82	10					
Mexico	C	18	2		1	1		
Panama Canal Zone	C	3						
SOUTH AMERICA								
Chile	C	50						
Ecuador	C	29	21					
Venezuela	C	20	6					
OCEANIA								
Australia	C	6	1					
Hawaii Territory	C	3	7	1	1			1

[1] For the month of May.
[2] For the month of January
[3] For January and February.

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-March 1941	April 1941	May 1941—week ended— 3	10	17	24	31
AFRICA								
French Equatorial Africa	C	2						
Gold Coast	C		1					
Ivory Coast	C	[1] 3						
[illegible]ea	D			4				
SOUTH AMERICA [2]								
Colombia:								
Antioquia Department	D	1						
Boyaca Department	D	3	1					
Intendencia of Meta	D	1						
Santander Department	D	2						
Tolima Department	D	1						

[1] Includes 2 suspected cases.
[2] All yellow fever reported in South America is jungle type unless otherwise stated.

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